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No. 86

Sustainable Rural Access

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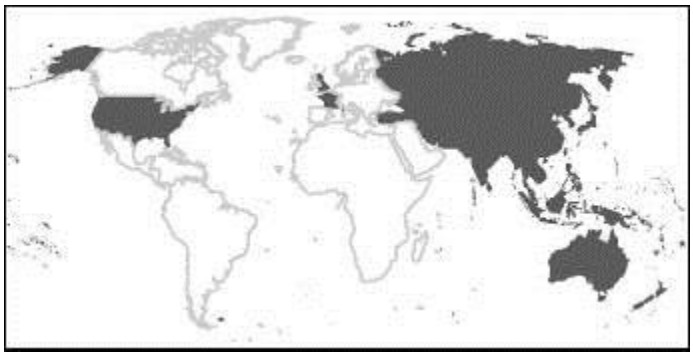

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Editorial statement

The *Transport and Communications Bulletin for Asia and the Pacific* is a peer-reviewed journal published once a year by the Transport Division (TD) of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP). The main objectives of the *Bulletin* are to provide a medium for the sharing of knowledge, experience, ideas, policy options and information on the development of transport infrastructure and services in the Asia-Pacific region; to stimulate policy-oriented research; and to increase awareness of transport policy issues and responses. It is hoped that the *Bulletin* will help to widen and deepen debate on issues of interest and concern in the transport sector.

According to the 2015 Millennium Goals Report, disparities between rural and urban areas remain pronounced. Transport accessibility is one factor that exacerbates these imbalances. Persistent spatial inequality due to inadequate transport infrastructure has resulted in disparities in economic opportunities and development between urban and rural areas. United Nations Sustainable Development Goals calls for efforts to end poverty and hunger through increased investments to improve rural accessibility. Physical accessibility to rural areas remains a critical issue despite regional and national initiatives to improve transport connectivity in Asia-Pacific and is a key contributing factor to rural poverty. Besides developing appropriate, affordable transport infrastructure and services, efforts need to be made to overcome the social, economic, political and physical constraints that people in rural areas face.

Transport plays a very important role in solving social and economic exclusion in rural areas. Various research studies have shown that improving rural access can help to create jobs, economic activity and thereby reduce rural poverty. Improved transport linkages to cities and townships also enhance the ability of people in rural areas to access healthcare and education. However, transport infrastructures in rural areas are often insufficiently maintained and fail to result in sustainable outcomes. Without adequate roads, rural areas would be cut off from technological developments and emerging markets and may continue to be disadvantaged. It is important that governments investigate and provide solutions to ensure that rural communities, which may make up 30 per cent of the global population by 2030, are not left behind.

The current issue focuses on the theme of “Sustainable Rural Access”. Each of the five papers considers different interesting aspects of the subject.

The first paper on provision of rural transport services: user needs, practical constraints and policy issues by Starkey offers a comprehensive overview of the current transport situation and problems in rural communities. It highlights numerous interesting examples of how people in rural areas solve their transport challenges (i.e. use of informal transport services and hubs) and explains the challenges that transport policy makers will have to overcome. The informal market addresses transport demands in rural areas but the prevalence of transport cartels continue to perpetuate poor practices. Effectiveness of regulatory measures to improve transport safety in rural areas depends on level of enforcement and rural transport operators have to find means to deal with the cost of compliance. Starkey cites the lack of provision of transport services as an area to improve on for the government as without services it is difficult to realize the full benefits of investments in rural road infrastructure for the rural communities.

The second paper entitled impacts of rural roads on poverty and equity by Sieber and Allen highlights differences in opinions and conclusions between various research studies on solving the problem of rural accessibility and the extent to which solutions can be implemented. Researchers differ in their opinions on whether infrastructure investment should be focused on the poorest areas or on areas that have potential economic viability (for example, in areas closer to towns and cities). Roads facilitate the opportunity for poverty alleviation in rural areas but they would not generate economic activity on their own. The benefits of these roads would depend on the economic ability of people in rural areas, through entrepreneurship or economic opportunities, to unlock their value. It has been shown in some studies that there is a correlation between road quality and economic activity in rural areas. In order to achieve sustainable outcomes, there should be greater focus on ensuring that roads are maintained and rural communities have access to reliable transport services so that they are not disadvantaged spatially.

The third paper by Ahmed and Nahiduzzaman is a village case study on a rural access improvement project in southwest Bangladesh. The project was initiated by the government to improve rural accessibility. Women were employed during the construction of new roads, providing economic relief for those women in poverty with opportunities to earn a living wage. The growth in income along the construction has also stimulated local economic activity and led to greater consumption of local goods and services. It becomes evident that government investment in transport infrastructure in these areas can have positive and profound effects on local economies and serves as a good reference study for further initiatives in rural areas.

The fourth paper by Hine, Huizenga and Peet talks about how the provision of transport services for people and goods in rural areas is a major, but often neglected, issue in developing countries. The authors suggest that besides financing road maintenance, road funds should also focus subsidy provisions on rural transport services as these services are often poor in quality and are provided by informal markets. The paper concludes that the "user pays" principle for road taxes and maintenance would not be a feasible model to use for maintaining roads in rural areas due to low traffic volume and low economic incentives for the government and private sectors. There are many challenges that arise in making the financing of rural transport services viable but most organizations, private sector or governments, are reluctant to be involved due to the risks involved. Besides having very fragmented markets, the rural transport sector had poor record keeping practices so it is difficult to find sufficient information to assess viability of investments.

Finally, the fifth paper by Cook, Sampson, Starkey and Visser discusses the weaknesses of current methodologies on applying research studies to real life leading to implementation failures in the long-term. Advances in relevant applied research can play a significant role in improving the effectiveness and sustainability of transport infrastructure. However, barriers to the implementation of new research outcomes remain a major challenge to the application of new knowledge in the rural transport sector. The authors highlight the need to improve management and delivery of embedded research and propose that policy makers adopt a guiding framework formulated. They provide example of the Research for Community Access Partnership (ReCAP) framework that can be applied to improve research outcomes. Two projects by ReCAP are cited in the paper and they explain how the methodology improves the rate of sustainable outcomes by removing friction in the implementation of applied research.

These papers discuss important policy issues related to improving transport accessibility in rural areas. They provide insights into different aspects of rural transport accessibility and offer interesting conclusions and recommendations for policy makers. It is expected that the current issue of the *Bulletin* would generate further debate and provide a point of reference for discussion among policy makers and researchers.

The *Bulletin* welcomes analytical articles on topics that are currently at the forefront, of transport development in the region as well as policy analysis and best practices. Articles should be based on original research and should have analytical depth. Empirically based, articles should emphasize policy implications emerging from the analysis. Book reviews are also welcome. See the inside back cover for guidelines on contributing articles.

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CONTENTS

PROVISION OF RURAL TRANSPORT SERVICES: USER NEEDS, PRACTICAL CONSTRAINTS AND POLICY ISSUES

Paul Starkey[1]

ABSTRACT

Rural people need transport services to travel to markets and services at local towns. Different types of rural transport users want passenger services that are affordable, frequent, predictable, safe and carry freight. Many different vehicles can be used, eperach with advantages. Passenger trucks may be more realistic than buses. Motorcycles are the most common vehicles on many rural roads. In some countries, motorcycle taxis provide vital, off-road access to homesteads, despite high tariffs.

Compliance with public transport regulations is poor on rural roads. Local officials are less stringent with regulations to accommodate transport services. High vehicle standards and strict enforcement can reduce services and increase prices. Regulations inappropriate to local situations fuel petty corruption. Cartels entrench poor practices.

Rural roads and transport services authorities are not integrated. Transport regulators are under-resourced and concentrate on urban and inter-urban services. Research should identify 'best practices' for rural transport services.

RURAL TRANSPORT REQUIREMENTS, PREFERENCES AND PRIORITIES

Rural access, poverty and transport

Good access is vital for poverty reduction and rural economic and social development. Rural people require access to key services (notably health, education) and markets (agricultural sales, household purchases, employment and income generating opportunities). They also wish to be able to access government facilities, take part in democratic processes and access religious, sporting and family events. Such rural access depends on appropriate infrastructure and suitable means of transport. Land infrastructure includes footpaths and trails, tracks and roads. The means of transport includes walking and carrying, which can be appropriate for short distances and where the infrastructure does not permit wheeled vehicles. The transport can also involve work animals, bicycles, carts, motorcycles, three-wheelers, cars, pickups, trucks and various sizes of buses (minibuses, midi-buses and large buses). Each transport mode has its advantages and disadvantages and infrastructure requirements. In some countries waterways and boats are extremely important for rural transport, but this paper addresses issues relating to land transport.

Rural access index

A major element in ensuring access is the provision of roads to connect villages to local market towns and service centres and to the national road network. Evidence from many countries in Asia, and around the world, has shown how the provision of rural roads has been associated with poverty reduction and improved health and education (Starkey and Hine, 2014). One indicator for 'measuring' access is the 'Rural access index' (RAI) developed by the World Bank. It has been defined as the proportion of the rural population living within two kilometres of an all-season road (Roberts, Shyam and Rastogi, 2006). However, no standardised methodology for determining this index had been developed and few countries incorporated suitable questions into national household surveys, as had been suggested. More importantly, this was simply a national-level statistic which had relatively little value for prioritising rural investments at devolved levels. Some attempts were made to develop devolved-level RAI estimates (eg, Starkey and Cartier van Dissel, 2016), but recent research

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by a World Bank Team has proposed a 'new RAI' based on GIS data for roads and rural population (Iimi and Diehl, 2016). One great advantage of the new methodology is that it can be estimated at local level, and so used for district-level planning and prioritisation. The new working definition is the proportion of the rural population within 2 km of a 'good' road. There is still work to be undertaken to develop consistent methods of capturing road-condition data on what is a 'good' road in terms of rural transport.

However, while the RAI is a key method for estimating rural access, it only 'measures' infrastructure, and gives no consideration to the presence, absence or quality of rural transport services. Roads by themselves are not enough. People need means of transport. In most developing countries, only a minority of rural people own motorized transport, and so people depend on rural transport services to access markets and services. As will be discussed, rural transport services vary greatly, and tend to be relatively neglected by governments and development agencies. Most of the ideas presented in this paper draw on the author's observations and experiences conducting consultancy services relating to transport services in Africa, Asia and the Pacific.

Low volume rural roads

This paper focuses on transport services been villages and small towns, and between villages and junctions with national roads (where there are likely to be onward connections to towns). The roads between villages and small towns are generally small roads that may be unclassified or are at the lowest level of classification (generally the responsibility of the community or the local district authority). They are sometimes referred to as 'Low Volume Rural Roads' (LVRR) as traffic volumes are often well below 300 vehicle movements a day.

It is important to distinguish Low Volume Rural Roads from national, provincial or regional roads that pass through rural areas. The latter are basically inter-urban roads, linking towns, although naturally there will be some villages located along them. Inter-urban roads passing through rural areas generally have much higher traffic volumes and more transport services than the small roads that link villages to small towns. Unfortunately, there can be confusion. For example, road safety crash statistics may be divided into 'urban' and 'rural'. Most of the 'rural' data relates to national roads outside urban areas, not the Low Volume Rural Roads being discussed here. Some national decision makers find it difficult to accept the poor state of transport services on LVRR as they remember passing through rural areas (on national roads) and seeing bus stops and many transport services. In reality few national or provincial level transport personnel have time to visit the small LVRR to appreciate the reality on the ground. Small rural roads, and their problems of transport services, tend to be invisible to all except the local users of them.

Transport needs, preferences and priorities

Surveys of rural transport users (of different gender, age, occupation and abilities) in many countries have highlighted what rural people want from transport services (Starkey et al, 2002; Starkey, 2007a; Starkey, 2007b; Starkey et al, 2013b). Farmers and traders need access to markets to sell produce and buy inputs. Then want transport services that allow them to travel with baskets or sacks of produce to and from such markets. Rural households and artisans need access to markets and stores to buy necessities and inputs, and again they want transport services that allow them to carry their purchases, which may include some building materials. Everyone needs to be able to access healthcare, but the greatest need is for children and women of reproductive age. Children, older persons and people with disabilities may need to travel with a parent or helper. Children need to access schools. Primary schools are often (but not always) within reasonable walking distance, but middle and secondary schools are often too far for a daily walk, and so require some form of transport, or boarding arrangements, either of which can impose financial burdens that limit access to education for some children. People may need to travel for employment on a daily or regular basis.

For all these purposes, rural people need transport that is affordable, predictable and dependable, timely, safe and secure and that can carry people's goods and (when required) their supporting persons (parents/helpers). People also prefer transport that is uncrowded and clean and easily to enter and alight from. It is difficult for anyone to rank all these attributes, because it all depends on their particular priorities of the day, and their circumstances, which may change. Very often there are no choices, and so any ranking tends to be purely hypothetical. However, when

people do have choices, one can learn something about their priorities. For example, if there are two modes of transport to choose from, many rural people will opt for the cheaper option, but people with resources may pay more for a quicker journey and/or a bit more comfort.

Many rural people know they may have to wait at the roadside for perhaps an hour for a transport service. However, under conditions where transport is very undependable and very unpredictable, many people will simply not plan to travel. Farmers will not prepare crops for market and artisans will not make goods for the market if they are unlikely to obtain transport when they need it. Inadequate transport services may lead to a descending spiral of reduced mobility. When transport is readily available, people are more willing to adopt more mobile lifestyles for better economic opportunities.

Gender and transport services

Rural transport is a strong gender issue, with women's needs and priorities often differing from those of men (Turner and Grieco, 2000; Fernando and Porter, 2002; Starkey, 2007b; Duchene, 2011; Porter, 2013). While men may travel for one key purpose, such as employment or market participation, women are more likely to travel for several reasons, including family care and health and market participation. While an all-day return trip to the market town may suit men, women may prefer a later departure and earlier return. The dependability of the return transport is particularly crucial, as women are unlikely to travel if they cannot be sure of returning the same day. Women generally have less access to money than men, and so transport affordability can be a gender issue (Starkey, 2007b; Kemtsop and Starkey, 2013). Women have greater preference for safe transport and are less likely to travel on the top or on the sides of vehicles. However, crowded and cramped transport can be threatening to them. Most rural transport services are owned and operated by men. Opportunities for employment or entrepreneurial transport operations by women are rare for multiple gender-related reasons, including tradition, access to resources, power and security.

TRANSPORT TYPES AND OPTIONS

Buses, midibuses, minibuses and minivans

Buses of various types are commonly used for inter-urban transport, and sometimes on low-volume rural roads. The continuum of capacities can be thought of as comprising large buses (generally 35-60 passenger seats), midi-buses (typically 18-34 seats), minibuses (usually 10-17 seats) and minivans (6-9 seats). Individual countries and populations use many different terms to refer to their own passenger transport vehicles.

Different sizes of 'bus' public transport services offer advantages and disadvantages, in terms of economies of scale, speed of loading and operation, and profitability relative to transport demand. Their ability to cope with rough rural roads and poor environmental conditions is also a key factor. Due to low demand and poor road conditions, large buses are seldom seen on low-volume rural roads. In Sri Lanka, a project to develop a community bus service proved successful over many years, after switching to the use of a less expensive, older bus. The bus operated between a village and small town 13 km away, carrying 400-600 passengers a day (de Silva, 2014). Large buses, such as the Ashok Leyland (40-60 seats) are often able to negotiate rough roads but cannot generally cope with muddy or slippery roads (see Figure 1). Such buses can operate for very many years. In 2009, 21 per cent of Fiji's bus fleet was over 25 years old (Haworth and Starkey, 2009).

Figure 1: Large bus in Fiji (left); 19-seater buses in China (centre); Minibus in Timor Leste (right)

Midi and minibuses fulfil similar niches, but cater for different demand levels, with midi-buses being preferred where there is strong passenger demand, allowing greater economies of scale, and slightly lower fares. Neither type of vehicle can cope well with poor road conditions, often leaving poor rural roads to passenger trucks, pickups and jeeps. Minivans cater for even smaller demand levels, and their smaller wheels make them even more unsuitable for poor roads. In Fiji, minivans mainly operate in peri-urban areas, and in China they serve some villages where there is reasonable infrastructure but little economic transport demand.

Passenger trucks and pickups

In many countries, trucks and pickups are used to transport people on rural roads; particularly roads in poor conditions that would be difficult for conventional passenger vehicles (see Figure 2). Sometimes, these are primarily freight vehicles, carrying a few passengers associated with the operator, or transported as a favour (perhaps with some money paid). In some countries (including Indonesia, Fiji, Myanmar, Papua New Guinea and Timor Leste) there are light trucks and/or pickups fitted with sideways-facing bench seats, allowing passengers to be seated, but also enabling reasonable freight volumes to be carried (when carrying passengers and/or on separate assignments). These may be regulated as public transport vehicles. Security forces also often use similarly configured trucks with sideward-facing benches to carry police or troops.

Figure 2: Passenger trucks in Timor Leste (left), Myanmar (centre) and Fiji (right)

Photos: Paul Starkey

There are two main advantages of configuring trucks and pickups in this way for public transport. The clearance, wheelbase and power of such vehicles make it relatively easy for them to pass on poor roads. The flexibility of the configuration allows the vehicles to be used for passenger, transport, freight transport and mixed transport. On rural roads, the transport market is relatively small and often changes between days (market days and non-market days) and seasons (rains, harvest time, festivals). Passenger trucks and pickups are better placed to respond to such changes than more specialised passenger and freight vehicles.

The disadvantages of passenger trucks include low passenger comfort and difficult passenger access (although some have fitted steps at the rear). While some passenger trucks have weather-proof side sheets, passengers are more exposed to the elements and to mud, dust and dirt than they would in a passenger vehicle. Passenger trucks and pickups are strong, long-lasting and expensive vehicles. Even twenty-year-old vehicles are expensive compared with three-wheelers, and so operators tend to keep passenger numbers high to cover costs and make a profit. This may lead to uncomfortable overcrowding. In Myanmar, 'Dyna' passenger trucks (2-3 tonne trucks, not necessarily Toyotas) are licensed to carry 20 passengers (but it is not unusual for there to be 30 or more passengers). In Myanmar, even 'Hilux' passenger trucks (1 tonne pickups, not necessary Toyotas) can carry 25 passengers (including perhaps seven on the roof rack). Such loading levels are not permitted, but are not uncommon. Passengers tolerate this to benefit from timeliness and low fares (about 2 cents US$ per kilometre on rough roads).

Rural taxis

In many countries, there is a niche for relative low-capacity; four-wheel rural transport services that operate on recognised routes that generally connect villages with small towns or road junctions. Depending on the state of the roads, the vehicles used may be cars (old Toyota Corollas are common), pickups or 'jeeps' (see Figure 3). Unlike urban taxis, they do not specialise in point-to-point services, but are shared transport systems that operate like low-capacity feeder bus services (albeit, seldom to timetables). Although the vehicles are technically low capacity, with perhaps 4-10

passenger seats, loading levels are often high, with 10-20 passengers not uncommon (depending on the vehicle). They generally carry people and goods, at prices that are often twice as high as bus fares, but which are much cheaper than motorcycle tariffs. Their comparative advantage over minibuses is that their restricted passenger capacity that allows them to travel with a full load (or overload) even on routes of low transport demand. It is common for rural taxis to be old vehicles and these greatly reduce the capital overheads of the operators. Rural taxi operators appear more willing than minibus operators to travel on poor roads. Generally, rural taxis operate on routes that do not have competing bus services, and so can maintain their premium fares. In some countries, including Myanmar and Fiji, route-based taxis do operate in competition with buses, with people paying premium fares for faster services, although this is mainly on inter-urban routes (Haworth and Starkey, 2009; Starkey and Cartier van Dissel, 2016).

Figure 3: Rural taxis in Nepal (left) and Myanmar (right)

Photos: Paul Starkey

Motorcycles and motorcycle taxis

In many developing countries, motorcycles are the most common vehicle on low-volume rural road (see Figure 4). Their rapid expansion has been associated with much greater availability of low-cost motorcycles made in China, India, Indonesia and some other rapidly developing Asian countries. Many motorcycles are bought for use by individuals for transporting themselves and perhaps their family members. This is the case with most motorcycles purchased in China, India, Nepal and Viet Nam, for example. They may sometimes carry other people as a favour, and perhaps receive some money for this, but this does not really constitute a public transport service. In contrast, motorcycle taxis are operated, on a full-time or part-time basis, by people intent on making income by providing point-to-point, on-demand transport services for passengers and/or freight. Motorcycle taxis are common in urban and rural areas in many Asian countries, including Cambodia, Indonesia, Myanmar, Thailand, Timor Leste and Viet Nam. In most countries they are tolerated but largely unregulated. Safety helmet rules may be enforced in some areas, but are often ignored, particularly by passengers. In China, motorcycle taxis and all small-scale entrepreneurial passenger transport services have been banned, but some motorcycle taxi services do operate.

Figure 4: Motorcycles in Myanmar (left); Motorcycle taxis in Timor Leste (centre and right).

Photos: Paul Starkey

It is not entirely clear why the use of motorcycle taxis gain significant traction in some Asian countries but not others. Certainly, the spread of intermediate means of transport has many interacting elements relating to supply systems, transport needs, regulations, history, culture and random circumstances (Starkey, 2001). In general, motorcycle taxis start in urban areas, where there

is great demand for point-to-point transport services. With the practice established, some operators start providing services in rural areas, where there is less density of demand, but also less competition and great need. In some countries, including India and Sri Lanka, by the time motorcycles became widespread, there were already well-established informal urban transport systems that made use of motorized or non-motorized three-wheelers. Such three-wheelers were much less common in countries such as Cambodia, Myanmar and Viet Nam, where motorcycle taxis developed.

Recent research on motorcycle taxis in Africa has documented many of the benefits of motorcycle taxis to rural women and men, including employment opportunities, particularly for young men (Starkey, 2011; Starkey et al, 2013a and 2013b; Starkey, 2016). In many countries, motorcycles taxis can be profitable to operate and profitable to lease out, due to low capital costs, low operating costs, unfulfilled rural transport demand and informal private-sector systems for the leasing motorcycles for a daily fee (Starkey, 2007b; Starkey, 2008; Starkey, 2016). On some rural roads motorcycle taxis now account for 80 per cent of passenger movements and a similar proportion of small-freight transport. Motorcycle taxis generally operate relatively short distances (often less than 10-20 km) and complement other transport services by transporting people between villages and the road network, where longer-distance transport services operate. Rural people greatly appreciate this and value motorcycle taxis extremely highly, because of their great availability, dependability and timeliness as they provide reliable, on-demand, point-to-point services. Surprisingly, perhaps, this is true even for pregnant women, older persons and vulnerable people. While they would prefer the greater comfort and the lower tariffs (for route operations) of larger forms of public transport, such services are generally infrequent or unavailable to villagers. (Starkey et al, 2013a and 2013b, Starkey, 2016).

As motorcycles often travel off the road, along paths and tracks, they are changing the whole rural transport situation, effectively 'widening' the impact of roads. For example, rural families living more than two kilometres from an all-season road (the basis of the Rural Access Index or RAI) may now be able to call motorized transport (motorcycle taxis) to their village to transport family members and/or their goods. In this way, in many countries motorcycles and motorcycle taxis have had a huge impact on reducing rural isolation (Starkey et al, 2013a and 2013b; Starkey, 2016).

While motorcycles and motorcycle taxis are having a huge positive impact on rural access and mobility, there are many safety and regulatory issues that need to be addressed. Motorcycles offer little protection for drivers and passengers. They can be dangerous if balance and control is adversely affected by potholes, poor road services, weather and environmental conditions, overloading, inconsiderate traffic or pedestrians, animals crossing or poor driver behaviour (including, on occasions, risky actions, alcohol and drugs). Safety helmet use is low (particularly for passengers who may resent wearing helmets used by other people). Many drivers have had no formal training, and possess neither driver licenses nor insurance. National road safety statistics generally show high numbers of crashes and fatalities for motorcycle riders. The causes of crashes are numerous, but in one classic study in United States of America, most accidents involved other vehicles (and were mainly the fault of those other drivers); in those crashes which did not involve other vehicles, the main cause was a misjudgement by the motorcycle driver (Hurt, Ouellet and Thom, 1981).

In terms of transport services, one pertinent issue relates to the numbers of passengers allowed on a motorcycle. In most countries, the law allows one driver and one passenger only. In some countries, one can see four or five people on one motorcycle, dangerously overloading recommended passenger limits on motorcycles. However, the advantages and disadvantages of allowing a second passenger on Low Volume Rural Roads (LVRR) do not appear to have been researched. During a field visit at a rural transport workshop, some rural women interviewed considered that allowing two passengers on a motorcycle was necessary on their LVRRs (TFG and IFRTD, 2015). Firstly, there were no alternative transport options, for them. Secondly, many essential journeys, including travel with a child, an elderly person, or a sick person required three people: the driver, the vulnerable person and someone behind that person to hold them securely. Thirdly, with two women passengers, they felt more secure, and were more able to control any tendency of the driver to go fast or drive dangerously. Fourthly, the price per passenger was significantly lower if two people are carried, as each paid just 60 per cent of the fare for carrying a single person (Starkey, 2016 There appears to be no objective data relating to the costs (including crash risks) and the benefits (including economic advantages and access to medical attention) of carrying one or two motorcycle passengers on LVRR. Any discussion of such issues at a national or international level is difficult due to people's

obvious reluctance to condone illegal and possibly unsafe practices. However, at a local level, enforcement officers in many countries in Asia, Africa and Latin America are often reluctant to enforce compliance with the 'one passenger' limit (Starkey, 2016).

Three wheelers

Public transport using motorized three wheelers is well-established in many countries, notably for urban and peri-urban transport. There are a wide range of designs and various local names, including 'tuktuk' that is prevalent in Thailand. The most common is the 'Bajaj' three-wheeler 'autorickshaw' that was developed in India (originally using Italian motor-scooter components). It is now used widely in South Asia and is exported to many other countries in Asia and worldwide. It is well-suited to urban roads, but with small-wheels and relatively low power, it is less appropriate for rough rural roads or hilly areas. The more powerful 'Tempo' (originally based on a German three-wheeler light delivery van) has larger wheels and a more powerful engine and is more suited to rural roads. In the Philippines, motorcycle sidecars have been used, and in Cambodia, there is some use of trailers-pulled by motorcycles (so technically four wheelers, but fulfilling a similar niche). More recently, relatively low-cost three-wheelers based largely on motorcycle components have been exported from China and are spreading in many countries. These are often used with a 'bucket' load platform, suited to carrying small freight loads. They are mainly used in urban areas (with high density of short distance transport demand), but some are used in rural areas. In Myanmar, special bodies are constructed reminiscent of small passenger trucks with sideways-facing bench seats (see Figure 5). Some of these are used for rural transport services, typically carrying about 20 passengers, at tariffs that are more expensive than passenger trucks but much cheaper than motorcycle taxis (Starkey and Cartier van Dissel, 2016). However, three wheelers are seldom able to carry such transport loads on rough roads or in hilly areas.

Figure 5: Three-wheelers in Timor Leste (left), Myanmar (centre) and China (right).

Photos: Paul Starkey

Other intermediate means of transport

There is a wide range of other intermediate means of transport used in Asian countries, many of which have been developed by local entrepreneurs. In South East Asia, there are various types of diesel powered transport, derived from two-wheel tractors with trailers or innovative 'iron oxen' machines using engines derived from irrigation pumps or grinding mils. These are mainly used for rural freight transport, but are sometimes used to carry passengers. They often have slow speeds, but considerable power, which allows them to navigate quite rough tracks and hilly areas. In Myanmar, some two-wheel tractors (power-tillers) pull 'passenger-truck' style trailers and provide transport services between villages and markets (Starkey and Cartier van Dissel, 2016). In China, all non-conventional transport services are banned, including transport using power tillers and agricultural trucks, but informal rural transport of 'family members' is not uncommon on Low Volume Rural Roads (see Figure 6).

Figure 6: Two-wheel tractors with trailers in Myanmar (left) and China (centre and right).

Photos: Paul Starkey

TRANSPORT SERVICES PRICES

Transport services on rural roads differ in many ways from the more visible inter-urban transport. Long-distance, inter-urban transport can be profitable for operators, and cheap (per passenger-kilometre or per tonne-kilometre) for users. This is due to high demand, relatively low operating costs on main roads and large passenger and freight volumes (allowing significant economies of scale). Prices are also kept low due to active competition and, in some countries, active price regulation (mainly for passenger fares). In many countries, inter-urban passenger bus fares tend to be in the region of 1.5-2.5 cents US$ per passenger-kilometre (Starkey et al, 2013b; Starkey and Cartier van Dissel, 2016). On low volume rural roads, operating costs are higher due to poor roads. The relatively low passenger demand restricts the economies of scale possible by using high-capacity vehicles. With small vehicles and high operating costs, prices per passenger-kilometre tend to be in the range 5-10 cents US$ (Starkey, 2007b; Starkey et al, 2013b; Starkey and Cartier van Dissel, 2016). Motorcycle taxis tend to be even more expensive, at 10-20 cents US$ per passenger-kilometre, due to their low carrying capacity (Starkey et al, 2013b; Starkey and Cartier van Dissel, 2016).

Rural transport passenger fares in China are regulated and appear to be about 50 per cent more than those of other Asian countries (Starkey, 2013). The reason for this (and the defence of this) appears to be that the regulated standards are much higher: overcrowded and informal-sector operators are banned and only modern buses are allowed to operate on rural roads. Chinese bus operators are not incentivised to operate on Low Volume Rural Roads, even though, with the regulated fares, they could cover their operating costs provided half the seats of a 19-seater bus were filled. In one study in Pu'er, Yunnan, of 31 rural roads prioritised for upgrading, only four had operating bus services. Neither of the two rural roads studied what had already been upgraded had bus services (Starkey, 2013). Across the nearby international border with Myanmar, rural transport services were of a much lower standard, but were cheaper and more available (Starkey and Cartier van Dissel, 2016).

It is more difficult to provide comparable international figures for rural freight costs, as these are extremely variable, even within countries. Charges per tonne-kilometre for carrying small quantities of freight (50-200 kg) may vary by two orders of magnitude (a one-hundred-fold difference), due to different pricing systems, different distances and different vehicles (Starkey et al, 2013b).

TRANSPORT SERVICES HUBS AND ROUTES

A key destination for rural transport services are the nearby small towns that have produce markets, shops, government and private services, clinics or hospitals and secondary schools. These become transport hubs for the small-scale transport services that serve the villages. Such small towns are generally on the national road network and are served by inter-urban transport services, allowing connections to larger towns and other destinations for those who need to travel further. For many rural people, and in particular rural women, regular transport services between their village and small town is particularly useful. Depending on the distance, transport supply and passenger demand, people can travel to the town in the early morning and return later that morning, or travel to the town later in the morning and return early afternoon. Such regular transport is particularly good for multi-

tasking women who may need to access markets, health and education facilities in the same trip. In many Asian countries, including Myanmar, three-wheelers are able to provide such services as their small transport capacity can be well-matched to the demand. However, low levels of economic demand and more profitable transport opportunities mean that larger transport services rarely operate frequently between villages and towns, and sometimes only operate on market days on a day-return basis.

The operators of large capacity rural transport, such as buses and passenger trucks, generally make more money if they can travel longer distances and travel as much as possible on national roads. One way to achieve this is to have a transport service that starts in a village and leads to a large town, with much of the long journey on national roads. High capacity vehicles travelling long distances allow greater gross income per trip. Such vehicles are operating to and from larger urban transport hubs. Because the service starts in a village, it may be easier to obtain a route license than an inter-urban route. In China, a rural route is eligible for a rural transport fuel subsidy. Such a service can pick up passengers along the way, particularly on the inter-urban road sections that attract passengers. Such services provide important access to economic opportunities in the large towns, and mainly benefit men and people with the resources to travel. They tend to operate on a daily schedule, leaving in the early morning and returning near the end of the day. Such transport patterns are common in many countries, including China, Fiji, Nepal, Papua New Guinea and Timor Leste (Haworth and Starkey, 2009; MEH and Starkey, 2009; Starkey, 2013).

While long-distance bus services starting in villages are clearly valuable and beneficial to many passengers, they do not provide the same service as vehicles operating out of a small-town hub. A transport hierarchy with small vehicles serving small-town hubs may benefit more people and also provider 'feeder' services for inter-urban buses for those who need to travel further. Such systems operate quite well in Myanmar that has a very diverse transport fleet, numerous small-scale operators and minimal regulation (Starkey and Cartier van Dissel, 2016).

In contrast, in China small-scale passenger transport operators are not permitted and bus companies operate to and from large town hubs. These have little interest in developing smaller-scale transport services and these cannot arise spontaneously as entrepreneurial public transport services are prohibited. While some clandestine services meet the local demand, these cannot develop and flourish due to their illegal nature (Starkey, 2013).

In the flat Terai of Nepal, there is some complementarity with three-wheelers serving minor roads and tracks. In the hills of Nepal, where three-wheelers are under-powered, the evolution of such complementary systems is inhibited by the cartel system, as bus transporters may react against complementary jeep services, fearing they may be competitors (Starkey, Tumbahangfe and Sharma, 2013).

In Fiji, there are several bus companies operating long rural routes. There are also small-scale operators of minibuses, minivans and taxis. These do not generally provide complementary services on rural roads, due to the poor road condition, and they generally concentrate on the more profitable inter-urban routes. However, when they do operate on rural roads they tend to 'poach' passengers waiting at rural bus stops ahead of scheduled buses which can greatly affect the profitability of the bus services (Haworth and Starkey, 2009).

SAFETY ISSUES

Safety is a concern for rural people and for regulators and enforcers. No one wants to be in a crash or for there to be crashes. However, both rural people and rural-based enforcers tend to take a 'situation ethics' approach to safety: it all depends on the situation and the relative risks and the alternatives. If there are no safer alternatives, rural people and rural-based enforcers tend to accept 'poor' safety practices.

Road safety depends on numerous interacting factors including the design, quality and condition of the road, the condition and operational practices of the vehicles, the behaviour of drivers and other road users and the weather and environmental conditions. Rural road infrastructure tends to have relatively low safety standards that, for reasons of cost, may permit narrow roads, sharp bends, restricted vision, limited signage and relatively 'unforgiving' roadsides with few safety barriers. Road surfaces tend to be poor and eroded and road pavements, shoulders and drainage are seldom

well-maintained. The safety risks of the poor infrastructure are partly offset by the low traffic volumes and the necessity to maintain low travel speeds. As a result, travel on low volume rural roads may not be particularly dangerous. However, there is little clear evidence on this point as few, if any; national road safety statistics are disaggregated in a way that allows assessments relating specifically to low-volume rural roads.

Most, or all, safety legislation relating to rural transport services is made through national level regulations concerning vehicle loading levels (passenger numbers and freight loads), permitted vehicle uses, vehicle specifications and testing, operator competence, the rules of the road (highway code) and public transport operational requirements. In many countries, such national legislation is 'tightened up' following the publicity relating to a horrific crash. Long-standing local practices, such as carrying mixed loads of passengers and freight or transporting people using agricultural vehicles may be formally outlawed following a shocking crash that killed vulnerable people.

Throughout the world, fulfilment of safety obligations is strongly linked to the costs of compliance (or the benefits of non-compliance), to the level of enforcement, to the risk of detection and to the consequences of being found out. This is true for observing speed limits, ensuring technical and fiscal compliance and following public transport procedures and obligations. In rural areas, people may be hard-pressed to afford the financial and economic cost of compliance. In most countries, there is very little enforcement of transport regulations on remote rural roads themselves. The level of compliance for rural transport services is generally determined by the degree of enforcement in and around the service centres, small towns and markets to which transport services run. If the police and regulatory authorities are not strict, or if the consequences are minor (eg, a small bribe to overlook the infringement), compliance with many safety issues tends to be at the discretion of the operator. This is true of very many countries in Africa, Asia and the Pacific.

Overloading of rural public transport vehicles is one of the most visible signs of non-compliance with safety legislation (see Figure 7). In many countries, including Myanmar, Nepal and Timor Leste, it is not uncommon to see people travelling on the roof racks of buses, passenger-trucks, pickups and/or jeeps. In most developing countries in Asia and the Pacific, rural transport vehicles carry more people (and goods), than is officially permitted. It would be interesting to document the actual costs and benefits of such practices to provide evidence to policy makers and rural enforcers of the impacts of overloading.

Figure 7: Overloaded vehicles in Nepal (left), Timor Leste (centre) and Myanmar (right).

Photos: Paul Starkey

Reckless driving behaviour, including speeding (relative to the prevailing conditions) and substance abuse appear to be more crucial in causing safety issues than poor vehicle conditions or overloading. It is hard for authorities to regulate driving behaviour in rural areas.

REGULATION AND ENFORCEMENT

Rural transport passenger transport services have to conform to national safety regulations and certain technical and fiscal public service obligations. They may also be regulated for tariffs and routes. Freight operators are mainly regulated for safety, technical specifications and loading. There may be some enforcement by staff of the relevant road transport authority, notably at checkpoints and weighbridges. However, the numbers of transport regulatory staff in rural districts is generally tiny, and they tend to concentrate on administrative matters and the roads with high traffic volumes, such as urban areas and inter-urban roads. Enforcement of transport services regulations is generally left to

the police. A larger amount of police resources is allocated to areas with greater traffic volumes like towns and inter-urban roads. The police have the power to enforce transport services regulations, but seldom ensure complete compliance. Even in China, one of the most heavily regulated and policed countries, illegal practices can be observed (but are seldom discussed). In many parts of Asia and the Pacific, limited enforcement can be attributed to three main issues: lack of staff and resources; petty corruption; and sympathy with rural transport operators and passengers.

In many countries, the un-official but conventional penalty of non-compliance when caught is the need to pay a small 'gratuity' to the accusing officer. Provided the bribe is small, it may be more advantageous to the operator than the cost of compliance. This is generally the case with overloading, which allows greater income. The official also benefits from the extra income from bribes, some of which may have to be passed up the command chain. In such circumstances, neither the transport enforcers nor the transport operators would benefit from greater regulatory compliance.

Another key issue is that rural enforcers tend to understand the 'benefits' to people of non-compliance: when they are off-duty they may well travel in over-loaded vehicles, without seatbelts or crash helmets. They may be sympathetic to the benefits of rural transport operations, even those involving over-loaded, poor quality vehicles. To take a recent example from Africa, in a rural district in Ghana in 2016, police and local authorities received instructions from the capital city to prevent the operation of motorcycle taxis, which are very common but which are illegal throughout the country. The police reported that they could not do so, as the rural people now depended on the flexible 'feeder' services of motorcycle taxis (Starkey, 2016 and personal observation). In China, such apparent disregard for central authority would seem unthinkable. In China, it would be expressed differently: those people are not considered transport service operators, but simply individuals helping their 'family members' (albeit on a full-time basis, 7 days a week). Empathy with those involved in rural transport leads to one of the commonest features of rural transport regulation: ignoring the issue, benign neglect or, to use an English expression, 'turning a blind eye'.

ASSOCIATIONS AND CARTELS

In most countries, operators of transport form associations for mutual support. These range from associations of muleteers, to motorcycle taxi associations to bus operators associations and freight logistics associations. Generally, each association is for a particular form of transport in a specific geographical area, but in some countries there are broader associations, sometimes linking up to a national level. At this level they can be powerful voices, negotiating with national authorities on pricing and regulation, and influencing national policies on keys issues such as fuel prices, tariffs and competition.

Associations can play an important role in self-regulation. Transport services are often subject to the dilemma of 'the tragedy of the commons'. On communal grazing land, there is an inevitable tendency to increase stocking levels to a point where it is unsustainable: then it is in everyone's interest for someone to de-stock, but it is in no individual's interest to do so. So with transport operators, while there is a profitable demand, the number of transport operators will increase up to the point where there is too much supply, and there is a need to 'destock' and 'share' the demand in a way that is acceptable to all operators. The most common way is for associations to control rotas or queuing systems. In Ethiopia, the association responsible for rural transport routes organises route rotas, to allow members to share the more profitable routes, and also to service those routes with lower transport demand and profits.

A transport cartel is an association of operators that attempts to balance supply and demand in its transport sector and to reduce open competition between different operators, based on price or timeliness. Cartels can enforce queuing or rota systems on its members so they take turns to undertaken particular transport supplies, so sharing the transport demand between its members. They can also restrict competition by making it difficult (or impossible) for new entrants into the transport market. The main disadvantage of cartels is that they restrict competition on prices and service quality. On the other hand, they can prevent 'destructive' competition that might lead to the lowering of incomes and insufficient investment in vehicles and vehicle maintenance.

In South Asia, syndicates or cartels are very significant in Nepal, and there have been incidents of violence, including bombs in the offices of the regulating authorities. There are examples of operators of 'jeeps' having their vehicles burned because they were perceived to be competing with

buses (Starkey, Tumbahangfe and Sharma, 2013). In another example, one member of the Kapilvastu Jeep and Tempo Entrepreneurs Association had a relatively new jeep, causing customer dissatisfaction with the majority of jeeps that were old and dilapidated. The response of the association was not to start to upgrade the rest of fleet (an upward spiral resulting from competition) but to remove the newer vehicle and agree that newer vehicles would not be permitted on their routes (MEH and Starkey, 2009). In a more positive example in Nepal, a syndicate of bus operators in Rasuwa split and two operators started to run services in competition. When it was one association, tickets were sold from one kiosk and the operators departed on an agreed rota (a 'dial' system). This meant there was no real competition and passengers took the next bus, whatever its quality. When the bus operators separated, they departed at quite similar times, and passengers could choose the newer, more comfortable option. Prices were also discounted in response to the competition (MEH and Starkey, 2009).

TERMINALS AND BUS SHELTERS

Passengers that have to wait for transport appreciate being protected from the weather, with the opportunity to sit, and, if possible, have facilities such as drinking water, toilets and refreshment providers. They also greatly appreciate accurate information about waiting times. Transport terminals allow operators to concentrate their resources in one well-known area and for regulators (or associations) to control loading and departures. In competitive markets, some terminals (mainly inter-urban terminals) are private and restrictive as they are operated by a single bus company or association, to attract passengers to its particular facilities and transport services.

'Public' road transport terminals (used by several operators) can act as convenient interchanges between different transport services (eg, from rural 'feeder' services to inter-urban services). They also reduce traffic disruption caused by on-street public transport loading and waiting. Private, or public, investment in transport terminals and bus shelters seems desirable provided the costs are justifiable and there are no obvious disadvantages.

China has encouraged private sector investment in the building and operating of bus terminals for both rural and inter-urban bus services. A company (normally a bus-operating company) that builds and runs a bus terminal may claim subsidies for constructing or upgrading terminals. They are also entitled to put a surcharge on all tickets for journeys from that terminal, on a sliding scale (6-10 per cent) depending on the quality of the facilities being offered. One downside of this is that passenger fares have to be set higher to pay for the facility. If offered a choice, it is likely that many rural transport passengers would not pay a premium for there being a terminal. Nonetheless, once a terminal is established, all relevant public transport should use it. Because of the charges involved, it is not uncommon to see transport operators loading outside the terminals, to avoid the costs of using the terminals. Due to various incentives involved in terminal construction and operation, the development of transport terminals appears to be a popular policy within local authorities in China, with even proposals for village-level transport terminals (Starkey, 2013).

Another potential disadvantage of terminals (for passengers) is their location. If terminals are not adjacent to key destinations for passengers, they may cause further inconvenience, and may even require passengers to change to another form of transport for the final few kilometres. This may be reasonable for large cities, where some road transport terminals may be on the periphery of the city, allowing interchange with designated urban transport systems. However, similar planning would not be applicable to the small towns that connect rural areas.

Timor Leste has a policy (inherited from Indonesia) of locating transport terminals at the edge of a town, and this causes major inconvenience to rural transport passengers. For example, the small port town of OeCussi had a rural transport 'terminal' (without facilities) at Tono about five kilometres from the main market and ten kilometres from the port and town centre. Enforced regulations required minibuses arriving from the surrounding villages to end their journeys at this 'terminal', and passengers had to unload, with their produce and goods, and take 'urban' minibuses to the market. This increased the inconvenience and cost for rural passengers. Some paid $1 (US$) to travel with a sack of produce 20 km from OeSilo and then another $1 (US$) for the final five kilometres. Since it is a small town with little traffic, such regulations only benefited the (well-connected) urban minibus operators. The rural transport 'terminal' disadvantaged rural minibuses and their passengers (see Figure 8). A comparable issue was found in the small town of Lospalos in Timor Leste. Here an

elaborate transport terminal had been constructed about three kilometres outside the tiny town centre, and also thee kilometres from a new administrative centre. Officially all inter-urban and rural services had to use this, and arriving and departing passengers had to either walk with their goods or take an urban taxi. In practice, most services stopped in the centre of the town and this caused no problems due to the very low volumes of traffic (Starkey, 2009).

Figure 8: Rural passengers changing minibuses at unnecessary 'terminal' in OeCussi, Timor Leste

Photo: Paul Starkey

While passengers who have to wait for transport can benefit from the weather protection and facilities of bus shelters and transport terminals, it must be stressed that for rural people, the key priorities are predictability, reliability, timeliness and affordability. Initiatives to improve rural transport services should also concentrate on these key issues. Investments in terminals and bus shelters are unlikely have much beneficial impact on these priorities, and, as has been illustrated here, may even increase the overall cost of travelling.

NEED TO UNDERSTAND 'BEST PRACTICES'

Governments and aid agencies working in Asia and the Pacific, and other parts of the world, allocate very limited resources to the topic of rural transport services. Land transport budgets are generally high, dominated by infrastructure investment and maintenance, with rural roads relative to national and regional roads and highways. The regulation and planning of road transport services has a much lower allocation of funds and personnel than road infrastructure. With few resources, transport services authorities concentrate on areas of high transport volume, which are urban and inter-urban transport services. Few, if any, resources are allocated to planning and regulating better rural transport services. The tendency is to leave the private sector to develop ways of meeting the transport demand. Few, if any, large-scale transport companies invest in rural transport services. Small-scale entrepreneurs do try to meet the demand and earn a living, but with little guidance and few incentives from the public sector.

Investment in roads is often justified by assumed improvements in transport services. However, there are very few attempts, if any, by road projects to ensure these transport services improvements happen do happen. Road engineering departments and organizations often have very weak linkages with transport services planners and regulators. Developing an integrated approach to rural transport is fraught with institutional problems. The Asia Development Bank (ADB) has been pioneering approaches that view rural access and investments from an integrated perspective, and have developed the Sustainable Transport Appraisal Rating (STAR) system of project appraisal. This tool can be used for all types of transport project to ensure that positive human outcomes are considered at all stages of project planning, implementation and evaluation (Véron-Okamoto and Sakamoto, 2014). Several ADB major road investment projects in Asia have included work relating to transport services, including studies in China, Timor Leste and Myanmar (Cardno Acil, 2009; ADB, 2014; Starkey and Cartier van Dissel, 2016). However, stimulating long-term, collaborative approaches to rural transport within the various national authorities may prove difficult.

As should be clear from the information presented here, what constitute 'best practices' in rural transport is not well understood. How is it best to meet the needs of rural men, women and children and their goods, for transport services that are dependable, timely, affordable, safe and convenient? There is no simple answer to this, but three methodological 'best practices' seem clear. There is need to:

- **Understand rural transport needs and options from the point of view of rural people (differing by gender, age, occupation, income, etc)**

This is not automatic, as increasingly, people involved in rural transport planning and regulation may live urban-lifestyles, with little contact with the reality of rural transport issues. The responsible authorities need to make an effort to understand the issues through visits and people-orientated, diagnostic studies. The rural people and/or supporting organizations may need to explain the various priorities of the different rural stakeholders. It is important that transport-related survey data, including road safety statistics, are disaggregated for different types of rural people and for road type (separating low-volume feeder roads from inter-urban roads).

- **Seek solutions that positively improve rural access and mobility**

It is important to avoid the tendency to over-regulate in the interests of quality and apparent safety as this can remove some readily-available, affordable and locally-acceptable transport options. The consequences of regulation should be better transport, in terms of the priorities of the different rural people (who generally rank availability and affordability above comfort and safety).

- **Develop sustainable integrated transport systems that maximize the use of local transport operators and available transport modes**

The aim should be to have integrated rural transport services, that are likely to involve several different, complementary transport modes bringing passengers and freight to roadside pickup points and to markets and service centres. For the initial journeys from villages, low-capacity, multi-purpose vehicle are likely to be appropriate, and these may be privately-owned for a variety of reasons. They may not be conventional vehicles purchased specifically for transport services provision, but they may well be appropriate to allow some affordable access. Complementary higher-capacity services may require innovations such as consolidation of passenger and freight loads and/or route sharing.

Encouraging evidence-based research can generate appropriate "best practices" on rural road services. The Research for Community Access Partnership (ReCAP), provides such an example, which aims to stimulate research on rural transport. Rural transport projects and programmes should aim to provide better rural transport services suitable for different needs of all rural people, to reduce poverty, increase mobility and contribute towards economic growth.

CONCLUSIONS

People living in rural areas need roads and transport services to access markets, health facilities, education and economic and social opportunities. As most rural people in developing countries do not own motorized transport, they depend on transport services to transport themselves, their family members and their goods to local small towns to access markets, shops and services. Rural men, women, children, older person and people with disabilities have different transport needs and preferences but all require services that are available, predictable, dependable, timely, affordable, safe and secure. Surveys of passengers and studies of their transport choices suggest dependable availability is a priority, and regulatory attempts to improve safety and comfort should not have the unforeseen consequence of reducing availability. On national road networks, buses of various sizes are the main means of transport. However, the transport demand on low volume rural roads is low and variable and requires vehicles that can take people and freight. A wide range of transport types of various capacities meet this market, including motorcycle taxis, three-wheelers and passenger trucks. Their entrepreneurial operators often overload their vehicles, a reality often accepted as inevitable by the passengers and local enforcement officials. In the short term, blanket enforcement of national regulations will not be constructive if it reduces the mobility of rural people (of different incomes, gender, ages and abilities). Little attention has been paid to realistic best practices in rural transport

services. The transport sector is not integrated. Well-funded road engineering organizations and projects are not involved with transport services and transport services regulatory bodies are underfunded and concentrate on the high demand areas of urban and inter-urban transport. There is need to stimulate research on rural transport services to gain a better understanding of 'best practices' for planning and operating good rural transport services. There should be good evidence-based policies that are appropriate and lead to better, available, timely, affordable and safe rural transport services.

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IMPACTS OF RURAL ROADS ON POVERTY AND EQUITY

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ABSTRACT

The last 20 years has seen a considerable number of studies undertaken in order to assess the impacts of rural roads. This paper is the result of a meta-analysis of a number studies taking into account the impacts of various access and mobility issues. Contrasting opinions amongst the authors of the studies were noticed. A number of authors argue that rural roads should be improved in locations where poverty is most severe as improvement in access to markets provides opportunities for subsistence farmers to integrate into the market economy. Others argue that rural road access should be primarily improved in locations where economic opportunities are already better, and thus accelerate a dynamic process for commercial farming and manufacturing.

It was widely agreed that rural roads have considerable positive impacts on poverty. However, it should be emphasised that while roads are condicio sine qua non for development, they are not sufficient to generate poverty reduction on own. The ability of the poor to derive economic benefits from the use of roads depends on their asset base and the entitlements to resources and opportunities. Additionally, many authors claim that making access improvement, such as upgrading of paths, tracks and feeder roads; have a stronger effect than improving the main road network.

Most of the studies focused on the effects of road investments, but did not take into account the aspect of sustainability or gender. This paper looks at some conflicting arguments and also to what extent this may have a positive or negative effect on environmental and social sustainability. The unfortunate reality in many developing countries is that roads are not adequately maintained and he full benefits or road investments can be only realised if the roads are well maintained.

INTRODUCTION

The period between mid-2015 and the end of 2016 has been an important one for the international political agenda. The Sustainable Development Goals (SDGs), the Paris Agreement on Climate Change and the New Urban Agenda have all been agreed and transport as a cross cutting issue is critical to delivering many of their ambitions. Rural accessibility receives attention as an indicator for several of the SDGs (such as 1.4 – poverty alleviation) and, consequently, these highlights the developmental effects of improved rural accessibility. This period has also seen a considerable number of studies[3] undertaken in order to assess the impacts of rural roads. An overview on the impact studies is given in the annex[4].

It is widely agreed that rural roads have considerable positive impacts on poverty. However, while roads are *condicio sine qua non* for development, they are not sufficient to generate poverty reduction on own. The ability of the poor to benefit economically from these roads depends on their asset base and the entitlements to resources and opportunities. This paper looks at some conflicting

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[3] Asher 2015: India, Atsushi et al 2015: Brazil, Balisacan et al 2002: Philippines, Banerjee 2015: India, Chongvilaivan 2016: Timor-Leste, Cook 2005: Asia, Cook et al 2005: China, Dercon et al 2007: Ethiopia, Escobal 2003: Peru, Fan et al 1999: India, Fan et al 2000: China, Fan et al 2005: China, Ferf 2014: Democratic Republic of Congo, Gertler et al 2014: Indonesia, Gibson et al 2002: Papua New Guinea, Glewwe et al 2002: Viet Nam, Hettige 2006: Asia, Jalan et al 2002: China, South, Kandler/Bär 2004: Bangladesh, KfW 2013: Cambodia, Khandker 2006: Bangladesh, Kwon et al 2000: Indonesia, Mohapatra 2007: India, Qiaolun Ye 2006: China, Raballand 2009: Cameroon, Raychudhuri 2004: India, USAID 2006: Afghanistan, Van de Walle 2002: Viet Nam, Van de Walle 2009: Viet Nam, Warr et al 2006: Lao PDR
[4] The time period for the literature review is some 20 years.

arguments and also to what extent this may have a positive or negative effect on environmental and social sustainability.

The distinction between urban and rural areas has become unclear as they start to converge and overlap. There is more of a continuum between rural and urban areas and this is becoming apparent in regard to migration movements, multi-local livelihoods as well as increasing flows of goods, resources, capital and information. It is also being recognized in the international political agenda – as part of the new Sustainable Development 2030 Agenda. The accompanying Sustainable Development Goals and the New Urban Agenda agreed at Habitat III in the autumn of 2016.

This paper provides an overview of the most important findings retrieved in 26 scientific studies on rural roads in developing countries. This paper discusses the following impacts of rural roads:

- Agricultural production and marketing;
- Transport induced local market development;
- Wages, consumption and employment;
- Poverty impacts and alleviation;
- Transport speeds, costs and patterns;
- Access to health services and education;
- Investment in feeder roads vs trunk roads; and
- Gender aspects.

Increasing connections between isolated communities in rural areas and markets is vital to improving agricultural returns. Accessibility can be understood as the ease of reaching desired destinations given a number of available opportunities and the intrinsic barriers to travel from the origin to the destination. Barriers to access in the context of transport can be defined not only through travel speed and costs, but as well seasonal and weather-dependent accessibility. Usually, opportunities are measured in terms of employment, and impedance in units of distance or time (Niemeier, 1997). Many authors have complemented this view of accessibility by adding and developing existing and new components to the approach, constructing a wider theory about accessibility. Wee and Hagoort (2001) identified three main clusters to define accessibility measures: infrastructure-related, activities-related and mixed approaches.

Experience from KfW projects (Box 1) shows a wide variety of impacts. The studies reviewed found impacts in terms of:

- Transport Improvements:
  Improved access to markets, health services, school enrolment and completion, visit of other social services, increased transport services and lower transport costs.
- Social and economic impacts
  increased market activity with increased farm gate and market returns, income, wages, consumption, non-farm employment, agricultural production and less waste, poverty alleviation and some positive impacts on women.

Box 1: Impacts of the Rural Infrastructure Program II in Bangladesh

The German Financial Cooperation with Cambodia (KfW 2013) conducted a major impact assessment study about their Rural Infrastructure Program (RIP) II in Bangladesh and observed a number of positive effects.

- An average increase of 197 per cent on annual household income among respondents across nine influence areas.
- A reduction of about 37 per cent on total annual household transport cost.
- A reduction of about 15 per cent on the average "unit transport cost"
- A reduction of 56 per cent on average transport time.
- An increase of 86 per cent on average daily traffic along the programme roads with 139 per cent increase for motorized vehicles.
- A small but relevant increase of 0.65 per cent on primary school attendance.
- A remarkable increase of 26 per cent on the lower secondary school attendance, as well as an increase of 16 per cent on the upper secondary school attendance.
- More people are availing the health services from the health centres, the record showed an increase of 36 per cent in total average.
- Agricultural production has the following increases, rice (11 per cent), grains (4 per cent), cassava (146 per cent), fruits (16 per cent) and vegetables (23 per cent)
- Almost three quarters (74 per cent) of the respondents in the household survey perceived that the good roads have helped in the marketing of their products and in the improved flow of goods into the villages.

IMPACTS ON AGRICULTURAL PRODUCTION AND MARKETING

Starkey and Hine (2014) conducted a large scale literature review on transport and poverty assessing 360 documents on transport. They resume their findings as follows: "Most rural communities depend on agriculture (including crops, livestock, fisheries and forestry) for subsistence and income generation. There are numerous research studies and several wide-ranging reviews that demonstrate how improving rural access has led to increased agricultural production, lower costs for farm inputs and lower transport costs for marketed outputs. Studies in Ethiopia, India and Nicaragua showed increased fertiliser use, higher yields, enhanced production, employment, living standards and poverty reduction. The effects of improved rural transport on agriculture and poverty can be complex. Better road access leads to price changes in inputs and outputs and may affect cropping patterns, land prices and land ownership. It also provides various new opportunities for employment, immigration and emigration. How individual poor households are affected depends on local circumstances. People with resources are most able to adapt to changing market conditions and economic opportunities."

Rural roads are particularly critical to agriculture, which is the main source of income in rural areas. In India a large rural transport programme (Mohapatra et al 2007) made it easier to transport agricultural inputs to villages, which has led some farmers to switch from food crops to cash crops (such as ginger, jute, sugarcane, sunflower). Similar results were observed in West Bengal where agricultural productivity increased and that helped to raise income levels and expand household consumer choices among poor farmers (Raychudhuri, 2004).

TRANSPORT INDUCED LOCAL MARKET DEVELOPMENT

The above findings confirm the theory developed by Ren and van de Walle (2009) of TILD (Transport Induced Local Market Development) through the improvement of rural roads. From their research on the rural roads and local market development in Viet Nam, they found "significant average impacts on the presence and frequency of markets and on the availability of various services." Improving transport not only allows farmers to export their produce, there are also inward flows of goods that can improve the quality of life of local citizens, as well as non-commercial activities such as knowledge flows and new ideas. Examples are given in Box 2.

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Box 2: Road impacts in Afghanistan and Uganda

Impacts of rural roads in Afghanistan

In Afghanistan, USAID (2006) rehabilitated 49 rural road segments within their Rebuilding Agricultural Markets Program (RAMP). As an effect of this programme, the volume of net surplus exported from the treated villages increased, farmers got better prices for their products as they were able to transport their products to main markets and sell at competitive prices. The research found that opportunities for commercialization of agriculture within the zone of influence were far better with rehabilitation of the roads. Observations during the survey and PRA interactions with local informants indicate that the roads have also improved access to people traveling to district agriculture departments and medical centers. Local shops are fully stocked with merchandise items and prices are reasonable. A number of new economic initiatives have also sprung in some locations, like mills and workshops. Although it is difficult to attribute these developments entirely to the rehabilitation of roads, it is quite clear that the roads have provided the impetus for increased agricultural output and incomes.

Source: USAID (2006): Rebuilding Agricultural Markets Program (RAMP)

Rural road improvements in Eastern and Central Uganda with a focus on socio-economic benefits

A major rural roads project in Eastern and Central Uganda to rehabilitation roads, build markets and introduce agro-processing equipment took a community-based approach to providing agricultural infrastructure and raising the incomes of farmers. A high level of participation from residents of local communities helped to set priorities, select labour-intensive projects to build or improve agricultural infrastructure and maintain it after completion. The rehabilitated 3,089 km all-weather rural roads and over 200 rural roads. 52 rural markets were constructed and numerous assorted agro-processing equipment units placed. It raised awareness in local communities and mobilized residents to participate in taking inventories, setting priorities, and selecting projects to build or improve agricultural infrastructure and to maintain it after completion.

Since 2008, the project area has seen the proportion of marketed agricultural produce increase by 7.5 per cent, farm gate prices up by 36 per cent, post-harvest losses reduced by approximately 20 per cent and a 40 per cent rise in household income. Meanwhile, travel costs have dropped by 63 per cent. Other benefits include: the emergence of rural growth centers and more permanent housing; new schools and health facilities; higher school enrolment; better health, inter alia, because of more numerous antenatal visits to health centers especially for expectant mothers.

Source: African Development Bank

Evidence from Kivu Region in Eastern Democratic Republic of Congo (Ferf 2014, see Box 3) shows, that rural roads play a role in the economic growth of central villages (hubs), in particular through the growth in numbers of restaurants and shops. Roads stimulate the demand for construction materials and other consumer products from rural areas. To a lesser extent, residents observed an increase in the demand for local products as well as a small improvement in prices for their products and an improvement in the supply of consumer goods. This confirms the statement that roads are a precondition for local development, but the dynamism of this process depends very much on local economic potentials, such as agro-ecological potential, training levels or available risk capital.

Box 3: Roads and markets in Kivu District, Democratic Republic of Congo

Even poor people can now sell goods at the market or along the road. Before upgrading the road, there was no demand for products. In the past, products like salt and soap were not regularly available. These things are now available. They are expensive, but prices are slightly lower than before.

Source: Interview with local inhabitant in Ferf et al (2014)

Steyn et al (2014) raised an issue which has been rarely researched by investigating road roughness and the damage of produce (in this case tomatoes) transported on rural roads in California. Even though damage was clearly demonstrated, the research was not conceived in a manner to assess the impacts on prices due to damaged products. However, the effects of improved riding quality were observed by the above mentioned USAID Program (RAMP, 2006). Farmers started to grow high-value vegetables in larger quantities, presumably because the spoilage and loss associated with poor roads had fallen by 50 per cent. Most crops in the treated villages also showed higher yields than in control villages, arising from increased intensification of input use and higher cropping intensities. Therefore the RAMP Program attributed about 40 per cent of the total benefits to increased agriculture production and marketing, 26 per cent was due to reduced transport costs accrued to farmers, and the remaining 33 per cent were savings made by transport operators by way of reduced vehicle operation costs.

Some authors critically question the above findings: Van de Walle (2009) is critical about the impacts of rural roads on market development. She suggests that "small road improvement projects could have vastly larger impacts on local market development if they were targeted to places with initially lower market development, and equally important, accompanied by complementary social and economic policies aimed at improving certain attributes (e.g. adult literacy) or reducing the disadvantages of others (policies to reverse the effects of historical discrimination towards ethnic minority groups) that interact with roads to reduce their impacts."

In theory, producer prices increase after road rehabilitation due to the lower transport costs which are transmitted to local producers in a competitive transport market. This evidence is supported by the above RAMP Program example however, the theory is also contradicted in a scientific very credible research conducted in Sierra Leone (Casaburi 2013) which shows, that improved roads reduced market prices of local crops. These price effects were stronger in markets that are further from major urban centres and in less productive areas. In addition, these price effects are reversed in areas with better cell phone penetration. The latter is probably the explanation, since cell phones enable farmers to receive market price information and give them a better bargaining position with traders, especially in remote areas.

IMPACTS ON WAGES, CONSUMPTION AND EMPLOYMENT

One of the most frequent observations was the shift from agricultural self-employment to wage-earning employment. Asher et al (2015) compiled large datasets from India's rural road construction program that has built paved roads to over 100,000 previously unconnected villages since it began in 2000. The authors find "that rural roads increase economic well-being, as measured both by household earnings and night light luminosity". New road constructions to previously unconnected villages led to a 10 per cent point reduction in the share of households and workers in agriculture, with an equivalent increase in wage labour market participation. The authors interpreted these findings as evidence that rural roads facilitate structural transformation by increasing the access of rural workers to external labour markets, either via commuting or short-term migration.

Additionally Mohapatra et al (2007) observed that in India after the construction of roads, there was an improvement in the number of job opportunities, more avenues for self-employment and possible economic activities. Farming employment opportunities also increased due to a shift to higher earning cash crops and also to multiple cropping.

Van de Walle (2009) confirmed that after road constructions rural households in Viet Nam were switching from agriculture to non-agricultural, mostly service-based, activities. Research by Escobal (2003) in Peru "presented evidence of the impact of road rehabilitation on the importance of waged sources in rural household's income generation strategy…Furthermore, it recognizes non-agricultural wage income as the main source of positive impact of both motorized and non-motorized roads rehabilitation in the short-term." Road improvements in Bangladesh (Khandker et 2006) also had a significant impact on men's agricultural wage (increases by 27 per cent), fertilizer price (fell by about 5 per cent) and aggregated crop indices (price indices increased by about 4 per cent…, while output indices rise significantly by about 38 - 30 per cent). The overall effect of road improvement on household per capita annual consumption was 11 per cent.

Randa (2011) evaluated the employment-generating impact of rural roads in Nicaragua. He observed "an increase in hours worked per week attributable to the intervention of around 9.5–12.3 hours. Moreover, he observes tendencies of a graduation process taking place in the labour market: individuals moving out of unemployment predominately achieve employment in the agricultural sector (self-employment), whereas newly created service sector jobs primarily are taken by workers previously working in agriculture. The analysis suggests that the employment-generating effect comes through a combination of reduced travel time and better access to markets and larger, more integrated road networks."

IMPACTS ON POVERTY

The major question for development cooperation is how the above described impacts affect rural poverty. There is strong evidence that poor people benefit from rural road improvements. A large study (Fan et al. 1999) carried out by the International Food Policy Research Institute on linkages between government expenditure and poverty in rural India revealed that an investment of 10 Million Rupies in roads lifts 1,650 poor persons above the poverty line. This is equivalent to an investment of only 140 US$ per poor person[4].

Improvement in agricultural productivity not only reduces rural poverty directly by increasing income of poor households, it also causes decline in poverty indirectly by raising agricultural wages and lowering food prices (since poor households are net buyers of food). Similarly, increased non-farm employment and higher rural wages also enhance incomes of the rural poor and consequently, reduce rural poverty. The total productivity effect on poverty, some 75 per cent arises from the direct impact of roads in increasing incomes, 15 per cent arises from lower food prices and 10 per cent from increased wages.

Fan et al. (2000) examined the factors which contributed to the exceptional growth and to the reduction of poverty in China over the past decades. Government spending on rural infrastructure (roads, electricity, and telecommunications) helped reduce poverty and inequality substantially, mainly due to improved opportunities for nonfarm employment and increased rural wages. Among the three infrastructure variables considered, roads had the largest impact. They concluded that that with every 10,000 Yuan (about $1200) spent on rural roads eleven persons are lifted above the poverty line. In terms of impact on growth, for every yuan invested in roads, 8.83 yuan in rural GDP is produced. Roads yielded the largest return to rural nonfarm GDP, at 6.71 yuan for every yuan invested, 35 per cent higher than the return to education investment.

Cook et al (2005) looked at the impact of transport and energy investments in projects conducted by the ADB and the World Bank in China, Thailand and India. They concluded that most of the poor do appear to benefit proportionally from rural infrastructure investments and reduction in travel times in the medium term, although some could be marginalised. In China, they observed a better performance in poverty reduction in villages with road access. Smoother and faster motorized road transport also facilitated a shift to higher-value perishable products. Households, both poor and non-poor, substantially increased the share of their income coming from off-farm employment over this period.

Khandker et (2006) researched rural road investments in Bangladesh, which "reduce poverty significantly through higher agricultural production, higher wages, lower input and transportation costs, and higher output prices …. We find a poverty reduction (moderate and extreme) due to road improvements of about … 5-7 per cent. Thus, had the duration of road pavement taken about 5 years, we could argue that each year poverty fell by about 1 per cent, solely due to rural road improvements." Road investments are pro-poor, meaning the gains are proportionately higher for the poor than for the non-poor. The results suggest that the savings of household transport expenses are quite substantial, averaging about 36 - 38 per cent in the project villages.

[4] 1999 exchange rate

A number of other studies corroborate the above findings:

- The development of all-weather rural roads in the Lao PDR, a country with extremely difficult upland topography and many villages without access to such a road, appears to lower the rural poverty incidence by 7 per cent points (Warr, 2006).
- Kwon (2000) found in Indonesia that the poverty impact of growth was almost four times higher in provinces with high levels of road provision compared with those with poor levels of provision.
- Balisacan et al (2002) found similar results for the Philippines, but also found that the impact is increased if coupled with education investment.
- Glewwe et al (2002) found the poor households living in rural communes with paved roads in Viet Nam had 67 per cent higher probability of escaping poverty than those in communes without paved roads.
- Dercon (2007) confirms the above findings through a research in Ethiopia, which revealed that "access to all-weather roads increases consumption growth by 16 per cent and, reduces the incidence of poverty by 6.7 per cent."

These findings are confirmed by Gibson (2002) in Papua New Guinea supporting the notion that poor areas have the least access to infrastructure and so people in those areas may benefit the most from new investments. Thus, infrastructure spending, whether on new assets or maintenance of existing facilities, can provide a form of targeted interventions that favours the poor.

Van de Walle et al (2002) differentiates the impacts on the poor in her survey for Viet Nam: "The most interesting finding at the household level is that impacts significantly vary across income groups, and that the strongest impacts were for the poorest. In particular, although the time needed to walk to various places declined overall, time savings were more pronounced for the poorest 40 per cent of households." Duncan (2007) contradicts van de Walle regarding the effects on the poorest. "Project experience from several countries suggests clearly that households that do not report benefits from transport improvements fit the socioeconomic profile of chronic poor, typically suffering from disabilities, chronic disease, low education levels, and high dependency ratios. Nonetheless, short-term transport benefits may materialize for such households in the form of improved access to education, health care, and social services, which may then pave the way for better income opportunities in the future."

Starkey and Hine (2014), in their comprehensive literature review, gave a more sceptical appraisal of these types of benefits: "Where transport investments have stimulated economic growth, the poor have often benefitted only marginally – in many cases, they have not had the resources to take advantage of the opportunities afforded by better access. Good transport infrastructure is a necessary condition for economic growth and poverty alleviation, but transport investments alone cannot address the problems of the poorest households."

This scepticism stems from the fact, that the poorest sectors of society may not be able to benefit from improved transport and thus they may actually be left out and further disadvantaged by the externalities related to that growth (see as well Box 4 and, Hettige, 2006; Raballand et al, 2010; Khandker et al 2011; van de Walle et al, 2011). From an impact analysis of rural road projects and integrated rural projects in Asia (one of each type in Sri Lanka, Indonesia and the Philippines) Hettige (2006) concluded while communities and the poor benefitted, there was little evidence that the 'very poor' benefited from the roads.

Box 4: Road impacts on extreme poverty

Duncan (2007) argues that "transport planning for poverty reduction must take into account that poverty is not so much a village as a household phenomenon. There are poor households in well-off communities, and well-off households in poor and disadvantaged communities. Experience shows that bringing transport to a community initially creates benefits for the relatively rich households, while enabling some of the poorer ones too. The extent to which transport investments bring economic benefits to a household depends on the assets the household can mobilize to take advantage of the improved opportunity". Additionally, the less productive among the local producers may suffer, since they will be exposed to competition from outside suppliers. However, even if the poorest may not travel or transport goods themselves, but they will nevertheless benefit from improved access to jobs, consumer goods, and inputs to whatever they are engaged in producing transport creates opportunities to increase the productivity of the poor (Duncan 2007, p7). Better rural roads are a necessary but not sufficient condition for graduating from poverty. There is little evidence that roads have impacted directly in terms of reducing income poverty on those groups in each study community who were identified explicitly as being very poor. The ability of the poor and very poor to make significant economic use of a road depends on their asset base and the entitlements to resources and opportunities that they can command, as well as on the passage of time.

Source: Hettige 2006

IMPACTS ON TRANSPORT SPEEDS, COSTS AND PATTERNS

Obviously, rural road improvements changed transport patterns of their users. The RAMP Project in Afghanistan USAID (2006) observed that farmers saved travel time, ranging from 0.51 minutes/km by taxi/car to 1.14 minutes/km by truck, depending on the condition of the roads before the rehabilitation. Substantial gains of up to 5 minutes/km were also made by non-motorized transport. The supply of transport had increased substantially, especially share-ride taxis and mini-buses offering frequent service, whereas in the past the only service was a rural bus offering one or two runs a day. Improved roads have also influenced the number of trips farmers make to markets and district centres. On average, farmers are able to make 5 per cent more trips per year if roads are open throughout the year and the transport service is more competitive. Vehicle operation costs have gone down by at least 16 per cent, thus benefiting both transport operators and farmers – the latter by way of reduced fares and rates. Survey data indicate that freight costs for transporting inputs and outputs between markets and villages has gone down by 10 per cent after rehabilitation of the roads.

Van de Walle (2002) states for Viet Nam that the "the road rehabilitation projects significantly increased the availability of freight services in the project communes, although they had no overall impact on passenger transport".

IMPROVED ACCESS TO HEALTH SERVICES AND EDUCATION

Starkey Hine (2014) state that rural transport infrastructure and means of transport (including transport services) are crucial to overcoming the potentially fatal 'three delays' in health care (particularly perinatal care). These are i) the decision to seek health care, ii) the travel to reach care and iii) the treatment within the healthcare system (including referrals) and they all depend on access to transport. Where people are far from roads, their decision to travel is influenced by the problems of travelling by human porterage, stretchers, animals, bicycles or motorcycles. Good access to infrastructure and transport services are needed to ensure medical staff and supplies are available in health centres. Evidence from India, Nepal and other countries suggests that constructing and maintaining rural roads, paths and bridges leads to improved health outcomes and healthier rural communities (although there can be complex interactions and externalities that affect poor people).

Box 5: Interview with Church leader Manzini- Chefferie de Malumba, Kivu, Democratic Republic of Congo

However, in the past patients of this village needed to be carried by men to the hospital in Walungu (30 km) while when they died the body had to be carried back. In case the patient died after 15:00 there was no time to bring the body back, and it had to be buried there. If a taxi must be hired for transport of a sick person, this cost US$ 25. Sometimes they get it for US$ 15 when the owner is from the village.'

Source: Ferf et al 2014

Research in India (Banerjee et al 2015) shows, that the provision of roads increases the use of preventive health care by women and households. This is confirmed by an older research in India (Mohapatra 2007) where positive impacts were observed on accessibility to preventive and curative health care facilities; better management of infectious diseases, and attending to emergencies and increase in frequency of visits by health workers. Improvement in antenatal and post-natal care was observed by beneficiaries, thereby decreasing obstetrics emergencies. Road connectivity and an improved transport system enabled families to opt for institutional deliveries in hospitals outside the village. Decrease in infant and child mortality was also reported.

De Walle (2002) confirms similar findings through her research in Viet Nam: "The time needed to reach the closest hospital in case of a serious injury declined by an impressive three-quarter of an hour. There are positive (or non-negative) impacts on the availability of services in the project communes, In particular, increases in pharmacies, in the availability of credit from the Agricultural Bank of Viet Nam and in other government development projects were attributable to the road projects.

Starkey and Hine (2014) also regard access to education as follows: "Investment in rural roads, particularly to provide initial connectivity, leads to greater school enrolment (evidence from many countries including Bangladesh, Ethiopia, India, Morocco, Pakistan and Viet Nam). Investment in rural roads also leads to better staffing at village primary schools (evidence from India, Zambia and elsewhere)". Atsushi (2015) researched rural road improvements in Brazil and found "that improved rural roads changed people's transport modal choice. The paper also finds that the project increased school attendance, particularly for girls." Van de Walle (2009) confirms for rural roads in Viet Nam that "perhaps most notable, the project had significant, early and sustained impacts on primary school completion rates."

INVESTMENT IN FEEDER ROADS VS TRUNK ROADS

As mentioned there is debate on whether road investments reap larger benefits when placed on feeder or trunk roads. Starkey and Hine (2014) suggest that the improvement of local networks is quite positive, since "building roads (and/or trails and footbridges) to connect rural communities to the road network provides numerous benefits and reduces the numbers of people in extreme poverty. Trails and roads enable safer and faster access to markets and services." Evidence from Ethiopia, Ghana, Nepal, Uganda and elsewhere shows that upgrading footpaths to basic roads provides much greater benefits than upgrading existing rural roads to all-weather quality.

Government spending on rural roads in Uganda has had substantial impact on rural poverty reduction. A study of public investments in rural Uganda (Fan et al 2004) suggested that the most basic 'feeder' roads had a benefit-cost ratio of 7.2, with 34 people taken out of poverty for each million shillings invested. The benefit-cost ratios of gravel or tarmac roads were not significant while the impact of small feeder roads on poverty reduction was three times greater than gravel or tarmac roads, per unit of investment. Thus impact of low-grade roads such as feeder roads is larger than that of high-grade roads such as murram and tarmac roads (Fan 2004). This was confirmed by Starkey and Hine who suggested that the most cost-effective way to reduce travel time was to invest in minor rural roads.

Fan et al (2005), in an important study of the investments in roads in China, concluded that while China's huge investments in expressways was economically beneficial for China, the greatest returns to investments came from the construction of low-volume rural roads. The benefit/cost ratios

of ‘low quality’ (rural) roads were four times greater for national GDP than investments in ‘high-quality’ roads. Consequently, low-quality roads raise far more rural and urban poor above the poverty line per yuan invested than do high-quality roads. Therefore Banjo, Gordon and Riverson (2012) in their World Bank review of rural transport, emphasised the need to focus rural transport investments on the lower end of the rural road network—community roads, paths and trails—in order to meet the rural access and mobility needs of smallholder farmers.

The above positive assessments are somewhat contradicted by Raballand (2009), who observed in Cameroon that “isolation from a tarred road is found to have no direct impact on consumption expenditures in Cameroon”. The only impact is an indirect one in the access to labour activities. The paper reasserts the fact that access to roads is only one factor contributing to poverty reduction. Considering that increase in non-farming activities is the main driver for poverty reduction in rural Africa, the results contribute to the idea that emphasis on road investments should be given to locations where non-farming activities could be developed.”

Qiaolun Ye (2006) undertook an extensive ex-post evaluation on the poverty impacts of the Southern Yunnan Road Development Project in China. The author presents findings that differentiate between areas with high development potentials and remote poor villages.

- In areas with “high potential for developing commercial crops, most households rose from poverty by growing these crops, which were promoted by commercial firms that signed contracts with farmers and purchased their production. In these areas, good roads were critical to attracting commercial firms to engage in contract farming.”

- In contrast, “upgrading isolated roads to poor, small villages located in remote and poorly endowed mountainous regions had a marginal impact on poverty reduction. Poor resource endowment and adverse farming conditions meant the poor in remote villages had little surplus to sell” Additionally, “the improved roads…did not mitigate lack of employment”.

The author concludes that a “better alternative could have been upgrading roads in other parts of the county that had high potential for commercial agriculture, such as areas adjacent to towns, or large villages in lowlands with sufficient land and favorable conditions, such as sufficient water, even if they are not poor”.

Chongvilaivan (2015) found in Timor-Leste that proximity to roads alone may not necessarily result in improved welfare, since roads are often in a bad condition. Instead, ensuring all-weather access to roads appears to be a more significant factor in raising household well-being. Specifically, road accessibility during the rainy season is regarded as essential. “This suggests that in Timor-Leste, and likely in other developing economies under similar conditions, maintenance of existing roads is more essential to well-being than building more roads. Rather, our findings suggest that it is necessary to improve the quality of roads such that they remain intact at all times, thereby ensuring constant and uninterrupted accessibility”.

GENDER ISSUES

Several authors mentioned positive impacts of rural roads on women with the key indicator being increased female visits of health centres. Cook (2005) ascertains that “women, particularly poor women are often at risk by the lack of or poor quality of transport services. Reliable transport seems particularly important in encouraging parents to allow girls to continue their education, and in enabling women to participate in social and economic activities, outside the village.”

The positive impacts generated for women involved in road maintenance is mentioned by Qiaolun Ye (2006). There are also some experiences where women have formed successful cooperatives to maintain the roads, after receiving some basic training and some evidence that this has proved to be more reliable than if men organise this or if it is left to the district authorities.

Box 6: Gender and Development Cooperation Fund

The Gender and Development Cooperation Fund (GDCF) pilot demonstration project of the Asian Development Bank increased the funding for routine maintenance of rural roads in Dehong Prefecture, Yunnan Province, People's Republic of China making it possible to finance the remuneration of maintenance groups that work year-round to keep the roads open and to slow down road deterioration. This pilot project also provides a rare opportunity for off-farm employment especially for women and ethnic minority groups. Some 165 km of rural roads were successfully maintained by women's road maintenance groups resulting in continued access throughout the rainy season, as well as, improved road conditions, benefiting transport services and facilitating access to markets, schools, and health facilities. For the first time, the women were paid for their maintenance work and the flexible nature of the output-based payment system enabled them to easily combine this work with other household and farm responsibilities. Wages obtained from the maintenance work provided a major boost to household incomes, raising these beyond the official poverty line and providing the women with greater decision-making power in their households. The skills acquired to operate as maintenance groups and the quality of the maintenance work carried out, demonstrated the potential of ethnic minority women and their status within the community improved. They are now more easily able to participate in the management of public infrastructure. The pilot project has also improved gender awareness at different levels and has provided complementary training on economic activities with the aim of increasing the livelihood options for women. This approach to road maintenance by women's groups has the potential for wider replication in the People's Republic of China and in other developing countries.

http://www.adb.org/sites/default/files/publication/28945/manual-road-maintenance-womens-groups.pdf

Experience shows that engaging women as well as men in rural and urban transport planning and decision-making taps into their practical experience and often increases quality control and financial transparency (Making Transport Work for Women and Men, World Bank 2010)[5]. Women are also seen to have a higher motivation to ensure that access is maintained not only to ensure produce gets to market but also for children to attend schools, access to health care and opportunities to buy consumables.

It is well documented that women suffer more from time poverty in rural areas (as they not only have to work the fields, but bear children and care for their families at the same time). Improved nutrition from a more varied diet engendered by new products brought in with better road connections can help them be stronger physically. Additionally, the ability to buy a wider variety of goods at better prices can also have had a beneficial impact on their families, and the growth of children. In addition, women often are able to benefit from the opportunities to develop small entrepreneurial activities associated with the increased economic activities (World Bank 2010).

On the other hand there may be also less beneficial aspects that may occur with improved road access, which affect women more. Roads increase inwards and outward flows of goods and people and they may accelerate the depletion of population in rural areas. Able bodied men and young adults are more tempted to escape to cities in the quest for better paid jobs. Better access can, therefore, leave older people and women with children stranded in the outlying rural areas while men leave to work in peri-urban or urban areas for the high wages than they are able to command from agricultural activities. There is some evidence in Africa of increased numbers of female heads of households in rural areas as a consequence of (but not solely due to) this[6]. In nine countries, six in sub-Saharan Africa and three in Latin America and the Caribbean, at least one in five households is headed by a female and female headed households are most common in Ghana, Kenya and Namibia, where one-third of all households are headed by women[7]. It is also documented that women frequently do not have a 'voice' in many of the dimensions of development, despite being a head of household and may not be included in stakeholder discussions about access due to a variety of reasons. But once this occurs there is often value added to the project as seen from the Yunnan example (and others documented in the Making Transport Work for Men and Women report).

[5] http://documents.worldbank.org/curated/en/2010/01/16281335/making-transport-work-women-men-tools-task-teams
[6] UNFPA (2008) State of the World Population 2007: Unleashing the Potential of Urban Growth, p. 38.
[7] http://www.dhsprogram.com/pubs/pdf/CS21/03Chapter03.pdf based on Demographic and Health Surveys, 1990-1994

Increasing women's access to transport and markets not only increases their productivity but also the overall productivity of the household and community (UNFPA 2008)[i]. However there is still a paucity of research available to be able to establish if the impacts affected women more than men, and little disaggregated information is available, apart from the evaluation of pilot projects. More detailed work on the long-term benefits to women and deepening the knowledge of how improved access can affect women would be welcomed.

CONCLUSIONS

Despite observed impacts being dependent on the local economic and geographic conditions, there is a consensus amongst the researchers about the positive effects of rural roads on income and poverty partly due to increased accessibility to social services and employment. Generally there were two major impacts observed:

- Many studies confirmed that rural roads induce a market led local development, via agricultural marketing and increased incomes from farming.
- Other studies revealed that rural roads increased the revenues from non-farming activities. This implies a shift from subsistence agricultural to commercial agriculture or manufacturing.
- However, roads are not sufficient to generate these effects on their own. The ability of the poor and very poor to benefit largely depends on their asset base and access to resources and opportunities. Thus, the very poor may not benefit from road improvements.

A number of authors argue that rural roads should be improved to the locations where poverty was most severe and the improved access to markets provide opportunities for subsistence farmers to integrate into the market economy and thus increase farm production, marketing and agricultural incomes. Many authors claim that upgrading of paths; tracks and feeder roads have a stronger effect on poverty than improving the main road network. The initial provision of access to markets has larger impacts since more income opportunities are generated than higher speeds and larger payloads on existing roads.

Other authors argued that rural roads should be primarily improved to locations where economic opportunities are best and thus induce a dynamic process for commercial farming and manufacturing, which again creates places of employment.

The approaches represent different views (and sometime political preferences). The first represents an approach to increase social equity, the latter represented a purely economic approach that intends to maximise the benefits generated per input unit. For example, China has decided to resettle inhabitants from remote mountain areas where income opportunities would remain low even with improved access. Voluntary resettlements to rural, compact, densely populated and well-endowed locations have been quite successful in reducing rural poverty. However, ultimately this may lead to unforeseen consequences and could increase uncontrolled migration into large cities.

Most of the studies are focussing on the effects of road investments, but do not take into account the life cycle aspect of the road. The sad truth in many developing countries is that roads are not adequately maintained and the impacts of road investments, often financed by donors, can disappear in a few short years. Insufficient public budgets for road maintenance, low priorities for rural roads and poor management by road authorities are all stated as reasons. Taking into account that the highest returns on road investments are achieved by road maintenance (40 per cent). followed by rehabilitation (20 per cent) and new construction (10 per cent) maintenance should be given a larger priority not only in research but also in operations.

The above observations are timely as 2016 sees a convergence of international agendas around sustainable development, climate change and Habitat III that can help governments to take action. There remain wide regional economic and social differences within countries and these continue to be important world-wide. Many include transport related targets and a number pertain to poverty reduction, rural access, increasing equity, women's empowerment and 'leaving no-one behind'. Yet these ambitions and the risks between dominant capital metropolitan regions and less well-funded rural areas, are usually constrained by poor road connections. From the current research it is not yet clear where it is best to make improvements and it is likely that as populations become

increasing urbanised, urban/rural tensions are likely to increase. Therefore it is recommended that greater attention and continued research is made to better understanding not only the direct transport impacts but also how to address poverty and equity with low carbon transport and increased connectivity.

Ex-post impact assessments of rural road improvements

Country	Author	Year	Transport Improvements					Social and Economic Impacts					
			Visit / access to health Services	School enrolment/ completion	Visit of other services	Transport services	Transport costs	Market Activity	Income / Wages /consumption	Non-farm employment	Agricultural profits / production	Effects on poverty	Effects on women
Afghanistan	USAID	2006	+			++	++	+	+		++		
Asia	Cook	2005										+	++
Bangladesh	Kandler/Bär	2004	+	+	+	+	+	++	++	+			
Bangladesh	Khandker	2006	+	+			+		+		+	+	+
Brazil	Atsushi et al	2015	+	+		+			+-	+-	+-		
Cambodia	KfW	2013	+	++		+	+	++	++		+		+*
Cameroon	Raballand	2009								++			
China	Cook et al	2005		+					+	++		++	++
China	Fan	2000							++	++			
China	Fan	2005									++	++	
China	Jalan et al	2002							+				
China	Qiaolun Ye	2006		+-						++	+-	+-	+**
Ethiopia	Dercon et al	2007			+				+		+	+	
India	Asher	2015							++	++			
India	Banerjee	2015	++										++
India	Fan	1999							++	++	++	++	
India	Fan	1999									++	++	

Country	Author	Year	Transport Improvements					Social and Economic Impacts					
			Visit / access to health Services	School enrolment/ completion	Visit of other services	Transport services	Transport costs	Market Activity	Income / Wages /consumption	Non-farm employment	Agricultural profits / production	Effects on poverty	Effects on women
India	Mohapatra	2007	++	+				+	++			++	
India	Raychudhuri,	2004							++		++		
Indonesia	Gertler et al	2014							+	+	++	+	
Indonesia	Kwon	2000	+									++	
1.1.1.1 Demo	Ferf	2014	+					++	++			+-	
Lao PDR	Warr	2006										+	
Papua New Guinea	Gibson et al	2002	Very general impact assessment									+	
Peru	Escobal	2003	+	+	+					++	+		+*
Philippines	Balisacan	2002	+	++					+			++	
Viet Nam	Glewwe	2002	+									++	
Viet Nam	Van de Walle	2002	++		-	+			+	++		++	
Viet Nam	Van de Walle	2009	+	+	+			+		+		+	
* female visits of health centres ** Women involved in road maintenance													
Impacts:	++ very positive		+ positive		+- neutral		- negative						

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IMPACTS OF RURAL ACCESSIBILITY ON WOMEN EMPOWERMENT: THE CASE OF SOUTH WEST BANGLADESH

Saleh Ahmed[1] and Kh Md Nahiduzzaman[2]

ABSTRACT

Poor accessibility usually has a large toll on development in South Asia. It deters people from various livelihood opportunities, such as employment, access to rural markets, health and educational services. It is critical for countries like Bangladesh, where millions of people live in rural areas and receive limited services and other livelihood opportunities. With a regional focus on southwest Bangladesh, this article ctitically analyzes the impacts of rural accessibility on poor and marginalized women. Based on an empirical research, this article provides insights on the importance of rural accessibility on poverty reduction and overall community development. Even though it has a geographical focus, the findings have a strong relevance to other countries in the Asia-Pacific region with similar socio-economic conditions. The study suggests that in addition to the benefits among poor and marginalized women, improved rural accessibility can help achieving pertaining targets of the United Nations Sustainable Development Goals.

Keywords: Women; Rural accessibility; Rural infrastructure improvement; Southwest Bangladesh

INTRODUCTION

Although poverty may occur due to several factors, poor accessibility is particularly critical (Sarkar and Dash, 2011). The lack of transport accessibility in rural communities has been identified as one of the main causes of poverty among rural people in various countries and regions in developing parts of the world (Lebo and Schelling, 2001). Adequate transport networks play an important role in enhancing employability in rural areas and in helping to improve social networks. It also contributes to improve peoples' capacity to absorb natural and economic shocks (United Nations, 2016). Due to poor or inadequate accessibility, developing economies, particularly in South Asia, often experience lower agricultural productivity leading to poor economic growth (Hussain and Perera, 2004). This suggests that transport infrastructure improvements in rural areas can be one of the major defining factors for poverty reduction and enhancement of peoples' quality of life and living standards (UNESCAP, 2003). Even though rural transport and accessibility receive substantial attention in literature, in practice there was limited effort to understand and analyze gendered aspects of rural accessibility into the knowledge domain of development (Rivera, 2007).

With a population of approximately 180 million, Bangladesh is one of the highly populated countries in the Asia-Pacific region, and it is facing various development challenges, such as poverty, inequality, food insecurity and climate-driven disasters (The World Bank, 2015; UNESCAP, 2015). Here, the rural population is experiencing far adverse realities, as extremely poor women, with incomes of less than a dollar a day, face heightened deprivation from rural accessibility. They continue to hold traditional roles of rearing children, taking care of other family members and maintaining household-centric affairs that are deeply rooted in social, cultural, and religious traditions (Ahmed, 2008). Their societies demand of them to spend large shares of their daily time with cooking, cleaning and family-related matters. However, these women aspire to play an important role in labor-intensive jobs in and around their communities to gain economic prosperity. The aspiration often gets hindered due to a lack of rural transport infrastructure and services that would have insured access to available jobs.

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Poor accessibility has an immediate impact on rural communities, more particularly for the livelihoods and perceived opportunities of women. The more time they spend every day on collecting water, firewood and other necessities, the less time they have to improve their income potential and standard of living through skill development opportunities and social interactions. Routine tasks often consume almost the entire day, if there are acute shortage or absence of basic infrastructures, such as clean drinking water, safe cooking fuels, electricity and local transport (Edmonds, 1998; Ahmed, 2008; Khandker et al., 2009). Therefore, the adequacy of rural accessibility appears to be critical not just for the local women, but for the entire rural community.

Despite a number of development projects in the southwest of Bangladesh addressing various local development components, few identified extremely poor and marginalized women as the primary beneficiaries. These women are highly vulnerable, because of limited employment opportunities in addition to other socio-economic and cultural deprivations. The recent worsening of climate-induced risks is making their lives even more challenging (Huq and Ayers, 2007; Dasgupta et al., 2014), since rural accessibility considerably affects individual's capacity to adapt to changing climate pattern (United Nations, 2016).

Based on the empirical research conducted on a rural infrastructure project in Bangladesh, this article analyzes the impact of rural accessibility on poor women. It also identifies the types of complementary social and health services that can make a positive contribution to the empowerment of women and rural communities. Finally, it addresses how improved accessibility can help reduce poverty and hunger locally and nationwide. Although this article has regional focus on southwest Bangladesh, its findings could be useful for other parts of the world with similar socio-economic traits and that are facing similar challenges.

In the following, a literature review and brief introduction of the project are presented. It further outlines long term and short term impacts of the project and finally conclusions will be derived.

LITERATURE REVIEW

In developing economies, rural accessibility is critical for poverty reduction (Chambers, 1980; Edmonds, 1998; Njenga and Davis, 2003; Fan et al., 2007). Better transport infrastructure creates opportunities for higher incomes and enhanced social well-being, while at the same time reducing vulnerability. Evidence suggests that food secutity increases as a result of better accessibility in remote areas. In general, rural accessibility contributes to making local livelihoods sustainable and resilient enough in face of slow onset climate variability as well as extreme climate events (United Nations, 2016). Other significant benefits from connecting rural regions is communities' higher independence from external support and the maintainance and/or enhancement of local capabilities and assets for now and for the future.

Traditional transport in remote rural areas has some distinct features, that are fundamentally different from its urban counterpart, as the socio-economic conditions of the beneficiaries of improved rural and urban transport differ as well (Donnges, 2001). Therefore, identifying the impacts of accessibility requires a broader understanding of rural people, their needs and development challenges. In rural life, the transport of goods is typically carried out on foot, whereas most of the journeys usually involve carrying some small loads on short distances (Donnges, 2001). Vehicle ownership among local people is low and in most cases the transport burden falls very disproportionately on women. The purpose of a large share of the trips undertaken by women are the critical tasks of procuring basic necessities such as water, fuel-woods, food stuffs as well as the growing and harvesting crops (Donnges, 2001; Edmonds, 2004). Consequently, women play the essential role in maintaining the wellbeing of their families. Any change in their living and wellbeing will affect the entire family accordingly. Therefore, in recent years there has been increasing interest and recognition of the importance of integrating gender into transport research, strategies and policies (Buiten, 2007).

Enhancing rural transport and accessibility is critical for economic growth and social development. It facilitates interactions between rural areas and external markets. A well planned labor-intensive rural accessibility project can be instrumental in creating local employment opportunities, particularly within construction and maintenance work. In addition, improved

accessibility helps people get better access to various social services, such as health and education (Asomani-Boateng et al., 2015). Since the early 1980s, major investment programs have brought about mixed results suggesting that infrastructure measures may not be very effective in improving local livelihoods (Ali-Najadfard, 1999). During that period, gender aspects were not fully integrated into the mainstream of the infrastructure debate, more precisely into the issues that cover rural accessibility (Fernando and Porter, 2002). However, despite women's contribution to families as well as in society, it is also important to remember that a large share of the world's very poor is made up of women (UNDP, 1995; Rivera, 2007; Global Poverty Project, 2012; Olinto et al., 2013). Without making a meaningful change and improvement in women's lives, it can be challenging to achieve substantial socio-economic development in rural regions.

In developing economies, the ability of the poor to engage in local and regional economic activities is often limited due to inadequate transport facilities and services. In line with this, a study has shown that poor accessibility is one of the major causes of local poverty and that it is a barrier to local development because it contributes to low productivity of land and labour (Ali-Najadfard, 1999). Investment into rural accessibility can, for example, be a catalyst for the establishment of small and medium-sized enterprises (Lokshin and Yemtsov, 2005). A rise of agricultural wages as well as the creation of employment opportuinities are among some of the major outcomes of improved rural accessibility (Khandker et al., 2009). Therefore, a reform of rural transport is crucial to meet the actual needs of affected populations in accordance with their real-life transport patterns (Ali-Najadfard, 1999). Several development agencies promote frameworks of labor-intensive rural road constructions and maintenance programs as primary tool for the creation of local jobs, particularly for impoverished rural women (Fernando and Porter, 2002; Ahmed, 2008).

The level of accessibility in rural areas often shapes an individual's ability to participate in local and regional economic and social activities. It is dependent on the available means of transportation, temporal (time) dimensions and constraints due to spatial locations (e.g. spatial poverty trap) (Odoki et al., 2001). Being adequately connected ensures opportunities, through which an individual at a given location can participate in a particular activity or set of activities. Adversely, inadequate access creates structural challenges for the poor and marginalized population in every context (Odoki et al., 2001).

In Bangladesh, the moderately poor[3] are the major beneficiaries of any rural accessibility program. Locally, people differentiate between the poor and extremely poor by their food-intake ability, in a sense that those who can afford a plate of rice with some vegetables, along with perhaps some fishes are usually considered to be poor, and those who do not have this opportunity can be labelled as extremely poor (Dietzel, 2006). As for the group of extremely poor women, they had restricted access to employment opportunities until recently, which occurred due to the common stigmatized perception about their constrained physical ability for work and overall trustworthiness in any formal working process. Since the 1990s, however, some structural changes such as neoliberal policies contributed to the incorporation of more diverse beneficiary groups in rural development projects in Bangladesh (Asaduzzaman, 2007). The overall effect of these projects on the women's livelihoods was positive in overcoming uplifting embedded challenges and limitations.

Taken together, all this evidence suggests that enhancing rural accessibility provides the foundation for reducing rural poverty, through the provision of employment opportunities for the poor and marginalized women, who are often not part of major development interventions.

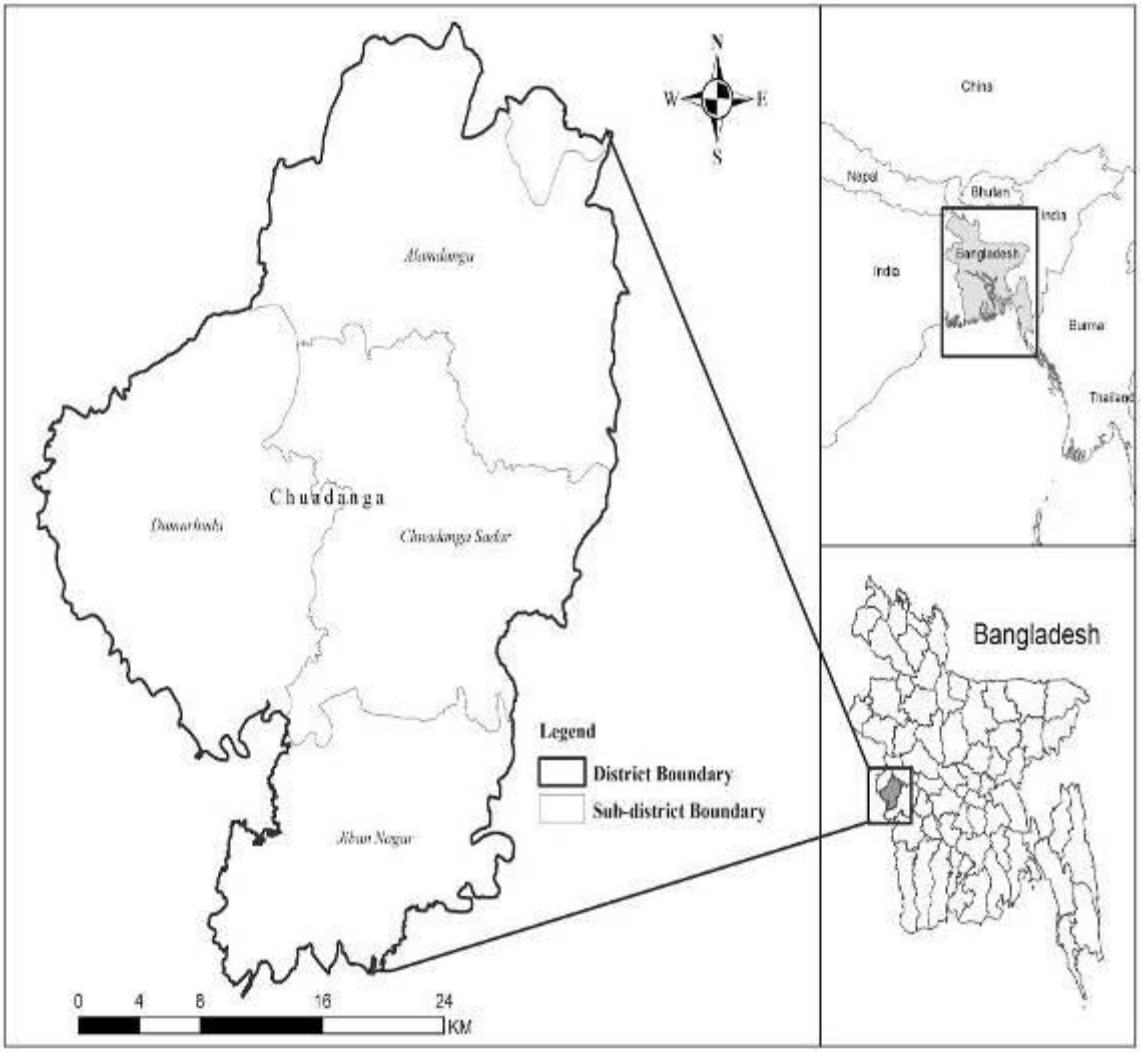
[3] with income between US $ 1.25 - 2 /day

THE STUDY AREA AND PROJECT

Study area

The study area is Chuadanga district, which is in the southwest region of Bangladesh and is relatively neglected in terms of government and non-government investments, livelihood opportunities and other social and economic determinants. It expands over almost 1170.87 square km (Bangladesh National Portal, 2016) has a population of approximately 1.1 million (BBS, 2011). The majority of the population is Muslims while a small portion is made up of Hindus. 49.95 per cent of all people are female (BBS, 2011). Even though the local societies are agro-based (BBS, 2011) a certain portion of framers are landless and they have very limited access to modern agricultural technology (Khan et al., 2009).

Figure 1: Location of Chuadanga District

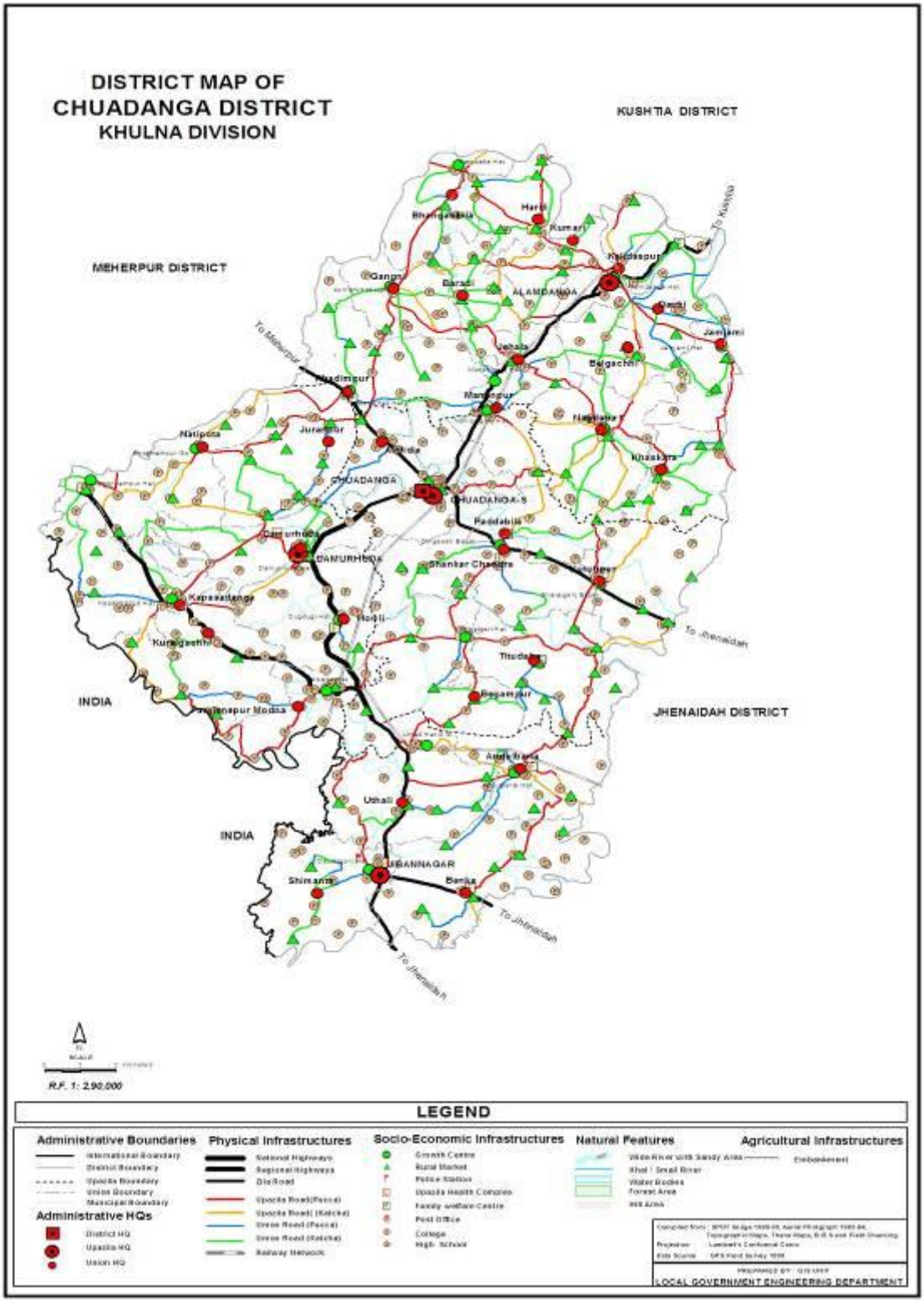


Source: Authors

Due to its proximity to the country's international border with India, a large portion of low-income people are involved in small-scale unofficial trading of cloths, and crops from India. Should border security be tightened, the poor would be left without their main source of income, which would make them even more vulnerable to food shortages. There has been a substantial lack of governmental and non-governmental attention to this issue, leaving unemployed or under-employed people behind with limited income opportunities (Ahmed, 2007; Ahmed, 2008). Several non-governmental organizations are working in Bangladesh with the communities to provide various services to local poor people. However, few work with the group of extremely poor women.

The district also suffers from a spatial poverty trap due to its distance from major regional and national cities. Market access has always been a challenge. Limited economic diversity contributed to low economic growth and restricted employment opportunities for women. In addition, lower public and private investments and limited political attention perpetuate the spatial poverty trap.

Figure 2: Detailed District Map of Chuadanga



Source: LGED (2016)

Rural infrastructure improvement project

The Rural Infrastructure Improvement Project phase 1 (the project) was implemented between July 2003 and June 2010. Based on the success of phase 1, second phase was initiated in other parts of the country.

Figure 3: A Project Road

Source: Authors

The phase -1 was initiated to reduce rural poverty through local economic development, rural development and improved infrastructure. The project was conceived as an Employment Intensive Infrastructure Programme (EIIP), aiming at improving accessibility through rural road construction and deliberately incorporating opportunities for local employment during both construction and management. Based on local needs and future potentials, two rural roads were constructed under the project (Table 1) and major physical components completed are shown in Table 2.

Table 1: Roads' names and lengths

Upazila	District	Name of Road	Length (Kilometers)
Damurhuda	Chuadanga	Chitla-Bagirhat	11.48
Damurhuda	Chuadanga	Damurhuda-Karpasdanga	9.34

Source: GITEC/GTZ (2006)

Local women were involved in most of the project activities. Traditionally, rural road construction works fall in men's domain. However, since worldwide poverty among the women is higher than among men (Global Poverty Project, 2012), The project was designed in a way that particularly those poor and marginalized local women were involved in the construction and maintenance of the roads, which also included tree plantation and stewardship across the roadsides. This mechanism of female engagement in the process was promoted and ensured by the Labour Contract Sharing (LCS) Agreement of the Local Government Engineering Department (LGED). This was initiated to provide fixed-term employment for landless destitute extremely poor women, as they could get an opportunity to come out of their poverty traps.

Table 2: Activities, planned under the project

Major Activities	Accomplishments
New construction or upgrading the poor conditioned roads	1325 km
Construction of bridges & culverts	7623 km
Tree plantation & maintenance	720 km
Improvement of rural markets/ growth centers	68 number
Improvement of rural ports on rivers (Ghats)	85 number
Construction of small ferries	3 number
Constructed of Union Parishad (Local Government) buildings	100 number

Source: GoB (2009)

RESULTS AND ANALYSIS

Impacts of rural accessibility on local economic development

The project contributed substantially to create and improve employability among the socially and economically marginalized women, who were previously left without any livelihood opportunities (Ahmed, 2007). Now they are engaged in various forms of micro, small, and medium-sized enterprises in their communities such as grocery shops, home-based handicrafts making, food catering services, etc. Their food consumption has also improved in addition to their expenditures on family health and education (Ahmed, 2009). The project contributed to raise the economically active population from 70.8 to 73.6 per cent. This also supported local communities in increasing their households' income by 109.5 per cent on project roads compared to baseline data (in constant 2004 terms) (LGED, 2009). In addition, evidence suggests that extremely poor women can play active roles in initiating entrepreneurial activities even in their households' premises, and they have the potential to gain meaningful financial returns after their own households'consumptions (Khandker at al., 2009).

Figure 4: Small entrepreneurships by local women

Source: Authors

Their wage working involvements are as follows (Table 3):

Table 3: Number of working days of the extreme poor women[4]

Number of Days	Per cent
200-365 Days	94 per cent
199-150 Days	4.5 per cent
100-149 Days	0 per cent
Unknown	1.5 per cent

Source: Ahmed (2008)

Two types of direct employment opportunities along with micro-savings have helped disadvantaged women as well as contributed to improve the local economy:

(1) Employment during the road and the supporting infrastructure development activities: The project required the direct engagement of local skilled, semi-skilled and un-skilled workforce for the construction and maintenance of the rural roads and other associated infrastructures. Road construction resulted in 40,037 person years of employment, where 22 per cent were female workers, and road maintenance will produce 42,000 person years of employment over the next 20 years, whereas 75 per cent of employees will be local poor women (GTZ, 2010; KfW, 2012). LCS of LGED

[4] Representativeness of this information could be arguable. Sample size was relatively small in comparison to the real population and selection was random, but with proper spatial representation within the region.

played an important role in ensuring their incorporation and employment opportunities under the RIIP-1.

Figure 5: Female workers in construction works

Source: Authors

(2) Employment through maintenance and tree plantation: The project offered relatively more stable employment opportunities for the targeted women. They are engaged in carrying out the routine maintenance of road embankment slopes and earth shoulders as well as plantation and caring of trees.

Figure 6: Female workers in construction works

Source: GIZ (2006)

Within the operational framework of the project, the generated number of labor requirements and the total income generation shown in Table 4.

In addition, these extremely poor women received various types of skill development trainings, such as basic accounting, and cooperative management. Moreover, they also receive various other trainings that link to micro, small, and medium sized enterprise development.

Local people experience challenges resulting from not having access to small loans or credits. In Chuadanga, access to traditional micro credit is not always available due to NGOs' regional and institutional preferences. For the extremely poor women, there are not many options available to access small credits for starting any small enterprise (Ahmed, 2007; 2009). Since they do not have stable incomes, personal savings for entrepreneurial activities are not available either. Within the framework of the project, extremely poor women were able to form small groups, which were designed in such a way that all the members save at least a tiny portion of their daily/weekly income. This helped them to start new ventures or small enterprises in addition to their engagements with the project (Ahmed, 2008). Within this self-managed micro-financial system, participating women selected

their own president and cashier. Members saved at least 2 Taka/day[5]. However, if anyone wanted to save more, that was highly appreciated. The president opened a joint bank account with the cashier, and savers received their money back by the end of the project or end of their contract with the project. It was also possible to specify a period, for example after 6 months, after which repayment would be effected. They were able to withdraw the money whenever they wanted, based on a mutual agreement.

Table 4: Direct employment and income generation[6]

Nature of Development	Barisal		Khulna		RIIP	
	Labor Requirement (Person days)	**Total Income Generation (000 Taka)**	**Labor Requirement (Person days)**	**Total Income Generation (000 Taka)**	**Labor Requirement (Person days)**	**Total Income Generation (000 Taka)**
Upazila Road	2 853 619	228 300	4 668 750	356 700	7 522 368	585 000
Union Road	-	-	619 583	47 300	619 563	47 300
Upazila Structure	482 057	38 600	290 472	22 200	772 529	60 800
Union Structure	-	-	26 410	2 000	26 410	2 000
Large Bridges	311 046	24 900	96 416	7 400	407 462	32 200
Growth Center	215 419	17 200	320 645	24 600	536 065	41 800
Ghat/Harbor	161 500	12 900	79 896	6 100	241 396	19 000
Union Parishad Complex	395 732	31 700	690 162	52 900	1 085 894	84 500
Ferry	-	-	-	-	-	-
Tree Plantation	319 988	25 600	479 441	36 700	799 429	62 300
Total	**4 739 361**	**379 100**	**7 271 755**	**555 900**	**12 011 115**	**935 000**
Total Employment (Person years)	**15 798**		**24 239**		**40 037**	

Source: GITEC/GTZ (2006)

However, due to the flexible nature of their savings and withdrawal, women were not always able to save enough money to start a new small-scale enterprise, which is largely because of the size of savings in addition to their daily challenges that demand more immediate attention (Ahmed, 2007), like payments for medical treatments and education. This financial savings-related challenge was identified and a new strategy of developing more robust plans for savings and re-investment in relation to entrepreneurship was proposed. It involved more economic and social support to beneficiary women in addition to skill development. They realized that if women cannot save sufficient capital to start their own businesses, they may continue to be disadvantaged within the poverty trap. Ultimately, increased employability, in addition to savings and improved rural accessibility contributed to making a meaningful change among the extremely poor women as well as in the community.

Moreover, once a week after their daily work, participating women usually discussed about the management, operation and prospects of their self-managed micro-financial system. Initially, LGED requested their supervisors, who were educated at least up to secondary school certification, to

[5] 1 US$ = 80 BDT (approximately)
[6] 80 BDT (Bangladesh Taka = 1 US$)

oversee the process. During their informal weekly discussions, possibilities for investments, associated required trainings and information were shared as well.

In summary, the project not only provided stimuli for the local economy through direct job creation, but it also improved rural development in multiple ways. There are now more economic activities, such as home-based grocery and handicraft shops. All these activities substantially improved households' consumption of local goods and services. Also, local entrepreneurs could increase their capacities to engage in gainful economic activities. The project improved economic opportunities for most of the rural poor and reduced their agro-based transports and marketing costs.

The project introduced five innovative practices and policies, which were the project's key success factors, particularly in terms of integrating the extremely poor women: (a) specific market sections' development for the disadvantaged women group; (b) participation in road construction, maintenance and tree plantation; (c) rural road infrastructure design through gender-sensitive approaches; (d) partnership with local government organizations; and (e) institutionalizing gender issues through project implementing agencies.

Access to market and development of rural growth center

Enhanced accessibility played a major role in boosting the local economy. The improvement of Upazila/Sub-district roads and of public facilities, such as growth centres and rural markets have a substantial positive impacts on agriculture production, socio-economic conditions and lead to poverty reduction (LGED, 2009). These local institutions play critical roles for the sale of rural productions and the distribution of agricultural inputs and consumer goods. Traditional rural markets are congested, unhygienic, dusty in the dry season and muddy in monsoon (LGED, 2009). The project improved rural transport and market places by developing rural feeder roads and unsurfaced roads connecting to local markets. It also developed market stands, pivotally aiming to reserve local women, and it improved the construction and management of these facilities with the collaboration of local stakeholders. The development of the growth centers and rural markets was very participatory in nature. The upazila parishads, local government units, contributed 10 per cent of the improvement costs from their own resources. Within the framework of RIIP-1, a total of 68 growth centers and rural markets were constructed and/or improved to ensure the safe trading environment in the communities (GITEC/GIZ, 2006). Visits to rural markets and nearby growth centers increased substantially after the project implementation (Table 5):

Figure 5: Visits to rural market and growth centers (per week)

	Trip to rural markets	Trips to rural growth center
Pre project	2.5	1.6
Post project	5.1	2.5

The market improvements and construction were accomplished through: employment of the LGED's established standards; paving and drainage of the market area; provision of internal roads and construction of covered selling sheds; open sales platforms; fish sheds; meat sheds; multipurpose sheds; and livestock slaughter slabs/sheds; installation on tube wells, sanitary latrines and garbage pits; and provision of an office of Market Management Committees (LGED, 2009). As a measure to encourage the rural poor women to use the markets, there are separate male and female toilets located so that women have the necessary privacy (LGED, 2009). In general, this market accessibility created opportunities for the local suppliers, farmers and particularly for the poor women to sell their products, such as handicrafts, and vegetables beyond their geographical boundaries with fair prices. It also extended their products' market not just in Bangladesh, but also in Europe and North America (Ahmed, 2007).

As for the intended gender-related outcomes, the share of women buying from the local market indeed rose to 32 per cent (which is a rather large figure in the context of Bangladesh), from 0 per cent before the project's inception. This phenomenal change in women's participation in rural markets and growth centers demonstrates RIIP's implications in the surrounding communities and region (Kuhnle, 2005). The project has also strengthened the institutional capacities of local implementing agencies, improved road safety, and provided support for associated consultancy services (KfW, 2012).

Livelihood perception and food security

Enhanced employability along with other livelihood opportunities created by the project contributed to the improvement of livelihood perceptions among extremely poor and marginalized women. It was evident that employment generation has enhanced social inclusion of everyday life, as opposed to previous despair and marginalization (Table 6):

Table 6: Livelihoods perception after the inception of the project[7]

Livelihood Perceptions For The Future	per cent
Better	95
No changes	0
Worse	0
Better + worse	0
No idea	5
Unknown	0

Source: Author (2008)

Locally, food consumption and food security among the extremely poor women were improved after the project due to local employability and higher incomes for poor and marginalized women. On average, people in rural areas consume three meals per day. Still, for the group of extremely poor women even one meal per day was uncertain due to their limited resources. The capacity of food intake was increased to two to three meals per day.

Simultaneously, "access to land ownership" was another challenging feature for local marginalized poor women (Abdullah, 2007). Where land ownership among the women could not be enhanced directly by the project, at least leasing of some agricultural lands for farming became affordable. This, in turn, fostered the development and improvement of agro-based entrepreneurship (Ahmed, 2008).

Access to health facilities

The accessibility to the locally available health facilities were improved in rural communities alongside the Chitla-Bagirhat and Damurhuda-Karpashdanga roads. As can be seen in table 7, people living these areas now have better access to the local health services.

Table 7: Improved accessibility to health facilities

Changing Aspects	Project Area	Control Villages[8]
Average time to reach to the nearest health facilities, which includes walking from home as well as using locally available transport modes (e.g. local bus, vans)	43 mins.	132 mins.
Observed time-saving in reaching the health facilities over the five years	70 per cent	2 per cent
Observed improvement of family health conditions	87 per cent	32 per cent

Source: Kuhnle (2005)

Access to skill development training and education

RIIP also resulted in education and skill development opportunities for extremely poor women and their family members. Specially, their children benefited in terms of education, because of facilitated access to schools and better household finances (Khandker et al., 2009). The training involved not only skill development in the area of basic accounting and financial management, but also on the establishment of small and medium-sized enterprises. Furthermore, local and regional NGOs were more interested in expanding their activities in this region than before, as it had become

[7] Representativeness of this information could be arguable. Sample size was relatively small in comparison to the real population and selection was random, but with proper spatial representation within the region.
[8] Control villages are those villages, which is not in RIIP/RDP-25 coverage area.

easier for them to approach remote communities. This has also created opportunities for poor women to integrate into mainstream market and financial system.

Ensuring universal primary education is still a large challenge for Bangladesh (Ahmed and Ypanaque, 2011). Government and other development partners are making efforts to address the issue effectively, particularly among the marginalized groups of populations. Since the implementation of the project, 59 per cent female students from extreme poor family were enrolled in primary schools, compared with previously only 32 per cent (Kuhnle, 2006). This suggests that the project has not only improved employability in the region, but also created avenues for education, leading to overall social progress in the long run.

Opportunities for investments

Since the inception of the project, external investors have made some small to medium-sized investments, creating demand for local labors (Ahmed, 2009). For example, external investors and businessmen worked with local women to produce various handicrafts merchandise, for which there is tremendous demand within the country as well as abroad. This lead to increased levels of local employment and provided social and economic incentives for further entrepreneurial activities. All of this not only helped the women financially who were directly part of the project, but it also increased overall local consumption (e.g. of food), stimulated interest in various other social services (e.g. education) within the larger community, as well as enhanced people's capacity to actually make use of them. Therefore, it was evident that the impacts of the project went beyond mere financial outcomes through the provision of incentives and opportunities to pursue wider social and development goals.

Possible risks

Even though improved accessibility has positive impacts on local economies and societies, it also imposes some potential challenges. Evidence from other parts of South Asia suggests that improved accessibility and road networks can contribute to an increase in female trafficking as well as smuggling of goods (Nepal, 2007). Since Chuadanga is situated at the border region, there exists the danger of similar incidents. However, strong social awareness in the rural communities along with active engagements of law-enforcement agencies can overcome this challenge. Furthermore, rural road construction can be the reason for potential disruptions of water channels and landscape fragmentation, which can affect land productivity along with overall food security. Ultimately it can have a negative impact on social and cultural diversity as well as on political capital (Faiz et al., 2012). However, it has to be mentioned that such effects were not observed in the project area.

Overall contribution

A majority of world's poor live in rural areas with limited to no accessibility to various services and livelihood opportunities. Many of them experience hunger and chronic poverty. These problems can effectively be address by enabling disadvantaged demographic groups through the provision of more efficient market access, which can create opportunities for employment and local socio-economic development. This is particularly important for countries like Bangladesh, where a large share of population lives under the poverty line. The project has successfully established employment opportunities and jobs for the extremely poor women through the focus on a labour-intensive infrastructure program (Faiz et al., 2012).

Figure 7: Impacts of improved acccessibility

Overall the project improved physical conditions of rural roads, improved local facilities such as local markets, boat riverports, ferries, and union council office complexes; enhanced infrastructure maintenance; and strengthenied institutional capacities of the implementing organisation; and capacity of small and medium-sized enterprises. Table 8 shows measure of success based on some selected indicators.

Table 8: Project indicators and status at ex-post evaluation

Indicator	Status at ex-post evaluation
20 per cent increase of income among the poor households	47 per cent increase of income among the poor households
30 per cent increase of traffic	Motorized traffic increased by 140 per cent, and non-motorized traffic increased by 57 per cent
A 10-15 per cent decrease in transport cost	Cost reductions were possible 65 per cent for passengers, and 63 per cent for goods.
A 15 per cent increase of volume of goods handled by markets	Market sales increased by 43 per cent

Source: KfW (2012)

Improved rural roads and accessibility in the project area has contributed substantially to the achievement of the government goals of poverty reduction and employment creation among the targeted beneficiaries. This way, the project also contributed to the attainment of the United Nations Millennium Development Goals (Table 9). The project has helped to alleviate poverty in the region through higher economic efficiency and lower costs and prices as well as better access to social and economic opportunities (KfW, 2012).

Table 9: Contribution of towards the Millennium Development Goals

MDG	The project Contribution
Goal 1: Eradicate extreme poverty and hunger	Employment generation (immediate, long-term) Lower transport costs and thereby increase the real incomes Time savings
Goal 2: Achieve universal primary education	Access to education
Goal 3: Promote gender equality and empower women	Female participants in local governance and market management committees Decrease of wage differences for equal work Promotion of female labor
Goal 4: Reduce child mortality	Access to health Road safety campaign
Goal 5: Improve Maternal Health	Access to health
Goal 7 *(partly covered)***:** Ensure environmental sustainability	Large-scale community-led plantation of trees by the road side

Source: GITEC/GIZ (2010)

CONCLUSION

Poor accessibility is a major developmental challenge in many parts of the world. It is particulary important in rural areas of the Asia-Pacific region, since a large share of the global population is situated there with minimal social and economic opportunities. With a case study from southwest Bangladesh, this article highlights the benefits of a carefully planned employment-intensive inhfrastructure program. Such an initiative not only improves rural accessibility, but also creates opportunities for local poor. More specifically, the project created local employment opportunities as well as an environment for inclusiveness and solidarity among poor and marginalized citizens, who, otherwise, would have been excluded from mainstream economic acitivities.

It is evident that rural accessibility can positively influence the development of local small and medium-scaled enterpreneurial efforts, improve food security and, moreover, improve possibitities for land ownership among the previously disadvantaged population. Infrastructure projects are usually evaluated in *economic* terms. However, an improved rural infrastructure has the potential to exert influence beyond that *economic* sphere. The project has proved its substantial implications for people's access to health facilities, which is traditionally a big challenge for the rural poor. It also created avenues for locally available skill development and education opportunities, which have tremendous impacts not just for the direct beneficiaries of the project, but also for future generations. The facilitation of investments on locally-grown small and medium sized enterprises can make a critical contribution to the overall local economic development.

Besides the project's socio-economic implications for southwest Bangladesh, it also provides insights for future reserarch. Relevant future studies might ask how rural accessibility can influence and/or shape political participation among poor and marginalized citizens. In addition, since various regions in the world are increasingly experiencing climate related risks, it can be extremely valuable to have deeper insights on how and to what extent rural accessibility can contribute to strengthen local capacities to cope with climate variability and other extreme climate events.

The project has proven to be effective in promoting local economic development, empowerment, access to roads and markets as well as in contributing to various aspects of social development. The success of the project has led other non-profit and government agencies to explore implementing more projects in the region. The project provides critical development insights for Bangladesh and other regions in developing countries, operating within a similar social and economic context. In that sense, it is always important to remember the following: poor is poor, not because they were born poor; but largely because of the structural challenges that they encounter throughout their lives. It is therefore imperative to adress local infrastructual challenges to unlock accessibility and provide new opportunities to local people.

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FINANCING RURAL TRANSPORT SERVICES: IMPLICATIONS FOR THE ASIA-PACIFIC REGION

John Hine, Cornie Huizenga and Karl Peet[1]

ABSTRACT

The provision of transport services for people and goods in rural areas is a major, but often neglected, issue in developing countries. Without adequate access to transport services there is real danger that the poorest, the elderly, the disabled, the young and most remote will suffer disproportionately and the social and economic development of rural communities will be severely limited.

All countries accept the need for state involvement in the provision of rural road infrastructure in developed countries, almost without exception, rural public transport services, are regulated and subsidized. In contrast, in developing and middle income countries government support for rural transport services varies widely from virtually nothing to a comprehensive programme. The paper explores these issues together with a range of initiatives that have been implemented and proposed by different Asian countries. The paper examines sources of funding and considers the need for collecting more information to improve decision making.

INTRODUCTION

There are major challenges to the provision of transport services in rural areas of developing countries, including in the Asia-Pacific region. The issues are common to many parts of the world but can be particularly acute in more remote rural areas where services can be non-existent or thin on the ground. Where transport services do exist, they can be unsafe and expensive. Despite this, most developing countries and donors until now consider providing rural transport *infrastructure* as the main solution, and they tend to overlook the crucial role of rural transport *services*.

This paper considers the role of finance in the provision of rural transport services and, in particular the case for rural transport service subsidies. The first part of the paper reviews the need to improve rural transport services and their current organizational structures. The paper then considers financial challenges and how rural transport services are organized and supported in both developed and developing countries. Finally, funding sources are considered and the paper ends with conclusions and finance related recommendations in support of developing and maintaining a greater availability of rural transport services across Asia and throughout the world.

What are rural transport services, and why do we need to improve them?

A lack of rural transport creates a major constraint on economic development and is a significant contributor to poverty in many regions. A disproportionate proportion of poor people live in rural locations. While 58 per cent of developing country population live in rural areas, 78 per cent of the extreme poor (Olinto et.al. 2013), and 85 per cent of the multidimensional poor (measured by the Multidimensional Poverty Index (MPI), (Alkire et.al 2014), are located in rural areas. At the same time, less than one third of the rural populations of Afghanistan (22 per cent), Myanmar (23 per cent) and Nepal (17 per cent) has access to an all-season road within two kilometres, and less than one half of the populations of Bangladesh (37 per cent), Bhutan (47 per cent), Mongolia (36 per cent) enjoy such access, thus limiting access to economic opportunities and essential services[1].

There are numerous concerns over the lack of access to markets and essential services in rural areas, and so far, governments and donors have tried to deal with this issue, almost solely by improving and maintaining rural transport infrastructure, leaving the provision and organization of

[1]John Hine, (Independent Consultant), Cornie Huizenga, Partnership on Sustainable Low Carbon Transport (SLoCaT) and Karl Peet, Partnership on Sustainable Low Carbon Transport (SLoCaT)
http://www.worldbank.org/transport/transportresults/headline/rural-access/rai-updated-modelbasedscores5-20070305.pdf

services that use the infrastructure to private organizations and individuals[2]. Obviously it is not possible to operate transport services without a supporting infrastructure and poor quality infrastructure affects transport availability and operating costs. The disproportionate emphasis on infrastructure development also shows in World Bank lending, where it was found that 98 per cent of rural transport lending is for road building and maintenance (Tsumagari, 2007).

Some opined that much greater attention should be given to other components of the transport system, including e.g. “Roads are not Enough” (Dawson and Barwell, 1993) while others have suggested that transport services are the “forgotten problem” and that we cannot rely on the widespread assumption that investment in roads will spontaneously lead to the provision of transport services by the private sector. The lack of affordable rural transport also has knock on effects on accessibility to schools, clinics, hospitals, markets and other social services (Porter, 2013).

Defining rural transport services

Rural transport services facilitate movement of people and goods in rural areas. The main focus of this paper is on motorized transport that takes place outside of the village area, for people and goods to travel between villages, markets and towns.

The typical modes of transport used in rural contexts are minibuses, buses, pickups, small and medium trucks, saloon cars, four-wheel drive vehicles, motorcycles, bicycles, donkeys, animal carts, tractors and power tillers with trailers. Although the cheapest forms of transport will tend to be used for personal transport they are all also hired for commercial purposes. The pedal-powered and motorized rickshaws in India and Bangladesh are examples.

Currently, probably the biggest change taking place in rural transport, worldwide is the huge growth in motorcycle use arising from the increased availability of relatively inexpensive Chinese and Indian motorcycles. An example is Tanzania where in 2005 31,000 motorcycles were registered, however by 2010 the number had increased to 323,000, representing annual rate of growth of 60 per cent per year (Ministry of Infrastructure Development, 2010). The growth now taking place in Africa, the Middle East, South Asia and Latin America follows on from earlier growth that took place in the 1990s in South East Asia.

Now it is very common to find in rural areas, motorcycle taxi services operating with mobile phones. The motorcycles operate a local service between peoples’ homes and the minibus, bus and truck stops where people and freight loads are consolidated and motorcycles can navigate tracks where three and four wheelers cannot pass. In some cases, and during the wet season, motorcycle taxis are the only form of public transport provided (Starkey et.al. 2013). Motorcycle transport, however, is relatively more expensive and often only the richer sections of the population can afford its use. In Myanmar motorcycles can cost US 30 cents per passenger-km, compared with conventional buses which may cost as little as 1.6 cents per passenger-km. (van Dissel et. al. 2015)

While there is growth in Africa’s non-motorized vehicle fleet, many of the fast growing economies of Asia are replacing their bicycles by motorcycles or cars. For example, between 1995 and 2005, China's bicycle fleet declined by 35 per cent (Roney, 2008). This is also true for many other Asian countries, where income increases enable their citizens to purchase motorized vehicles.

The organization and regulation of rural transport services differs between countries In general, authorities in developing countries pay far more attention to regulating urban and interurban transport than rural transport. Conventional bus services operating in rural areas are more likely to attract regulation of passenger fares than other rural services. In contrast, local freight transport and informal passenger transport are least likely to be regulated by government authorities, although sometimes they may be subject to regulation from transport associations.

[2] Poor regulation is not a constraint to transport services per se, but does result in a risk of unsafe services. More regulation may result in less frequent and more expensive services.

Rural transport user perspectives

The most common passenger complaints, particularly in the more remote rural areas relate to a lack of services, a shortage of emergency transport and to unaffordable fares. The most severe problems arise in sparsely populated areas in low-income countries. For example, surveys carried out in Ghana and Malawi have found that even though a village lies on a passable road it may be extremely difficult to access services, either because passing traffic is so sparse, or because vehicles leave the main destinations completely full and hence there is no capacity at intermediate locations. These surveys found that 30-40 per cent of the rural population have to walk at least 4km and sometimes up to 20 km to a vehicle pick up point, often at a road junction, to improve their chances of getting on a bus or truck (Hine and Rutter, 2000).

The new rural motorcycle services, while welcome for richer sections of the population, are not legal or available in all countries; for example, such services are illegal in China and Ghana. Recent surveys carried out on one 26 km road in Cameroon found six-days-a-week motorcycle transport was the only type of public transport available, with minibus services and light truck services only available on market day (Kemtsop and Starkey, 2013).

In Tanzania many people cannot afford to use rural motorcycle services. On one occasion it was observed by the author that people in Kilolo district would leave their village shortly after midnight to walk 5 hours to the bus stop to get the one bus per day into town. On another occasion older people complained that they physically could not get onto a motorcycle or on to the back of a pickup to go to town. Difficulties of using motorcycles and cycles are not limited to the elderly but also apply to young children, the disabled, as well as expectant and nursing mothers. (Porter et. al. 2013)

Similar stories are reported in other countries, for example in the mountains of Negros Oriental, Philippines, it was reported that old people are 'left to die' at home (with relatives doing as best they can) when they can no long withstand the stresses of being carried along footpaths and then held on the back of a motorcycle to make it to the main road where more conventional transport is available to go to hospital.[3]

It is difficult for people to get access to emergency health care in rural areas and any journey made to the hospital is often complicated by the weather, particularly during wet seasons when rural roads become difficult to access.

Out-of-village rural transport may also complicate access to education. While primary education is likely to be provided in the village area and is usually accessed via walking or cycling, rural secondary education generally requires longer distance transport usually by public transport. Inaccessibility has been found to be a major factor in lower attendance rates for girls in secondary schools in Nepal (Kc, S. 2007).

A high proportion of rural passengers take small loads on their journey, for example for selling or buying goods at market. Larger loads of agricultural produce, building materials, furniture, and soft drinks and beer are also very common. As with passenger transportation, there are also serious concerns about the frequency and costs of transporting goods. Transport for loads are called (often by physically going to the truck park) to pick up from specific locations by individuals, while traders and travelling wholesalers will pick up food products either at the side of the road, usually by prior agreement, or from village markets.

In 2010 it was estimated that about 1.3 million people died from road injuries worldwide, with 90 per cent of deaths occurring in middle and low income countries. The urban/rural split of traffic deaths is not known although there is evidence from India that the rural population is at much greater risk than the urban population, while little difference between these populations was found in Bangladesh (Aeron-Thomas et al, 2004). A major part of the problem is high speeds on interurban roads. For the most part rural roads do not have provision for pedestrians, and in the poorest countries pedestrians and those travelling on two and three wheelers are at greatest risk. In this respect the growth of motorcycle traffic is a major concern, particularly in view of the widespread neglect of riders and passengers wearing helmets in the proper fashion.

[3] Personal Communication to the Author, 2016.

SUPPLY PERSPECTIVES AND ORGANIZATION OF THE RURAL TRANSPORT SERVICES MARKET

Most transport services in rural areas in developing countries are provided by the informal market place. In low income countries transport services provide a major opportunity for employment and in some countries, particularly in Africa, but also in Latin America and in Asian countries such Yemen and Nepal, restrictive operating practices have developed that, while inefficient, keep employment as well as fares and tariffs high. Restrictive practices have also been employed by inefficient government owned public transport operators in Asia in order to keep employment high.

While previous studies have suggested that the relatively higher transportation tariffs in Africa, compared to other high population density countries in Asia, are due to a range of factors including higher input costs, newer studies have shown that profiteering by private operators may be a major contributing factor. (Teravaninthorn and Raballand, 2009).

Cartels employ various measures to keep supply artificially low as they have a dis-preference for carrying sub-optimal loads. It is not uncommon to find truck, taxi and bus drivers waiting for days and often up to a week in a queue before they get a load. It is possible to sustain these low levels of utilization by using low cost second-hand vehicles from high income countries that have minimal depreciation costs (usually those which are no longer suitable for urban transport services)[4]. These vehicles may be ten to twenty years old, and tend to be unreliable, and polluting with relatively high fuel consumption. Fuel consumption per passenger, or per weight of load, is minimized by the vehicle waiting until it is full at the start of its journey before moving.

It may be possible to improve services and at the same time reduce costs and fares by reorganizing or deregulating the transport market. This would involve increasing competition and reducing the power of transport unions or cartels that effectively keep large numbers of redundant vehicles in the market. New route licensing arrangements would be required (Delaquis, 1993; Ellis and Hine, 1998). An example of where direct measures were taken by local authorities in the Cameroon, to increase competition, reduce the power of cartels and reduce fare levels, is provided in Box 1.

The newest and highest quality vehicles are likely to be used on interurban and urban routes where customers have higher incomes and thus expect more comfortable journeys. Even within rural transport operations, Venter (2014) in South Africa has found a differentiated service

Box 1. Reducing rural transport cartels in Cameroon

Ngoundere District in Northern Cameroon provides an example where a local mayor decided to address the issue of poor transport services and high fares. In Cameroon transport syndicates determine fares and routes, and they negotiate with the authorities for access, and fees, for use of the terminals. In Ngoundere the mayor licensed different transport agencies to operate from different terminals in competition with one another. In two years passenger fares dropped by 50 per cent, and there was reported to be a greater frequency of service, with cleaner and better maintained vehicles. As a result fares in Ngoundere became dramatically lower than comparable operations in the South of Cameroon, which were found to be between 53 per cent higher (for trips of 10 km) and 370 per cent higher (for trips of 200 km) (Lisinge, 2001).

hierarchy with better quality minibus taxi services employed on surfaced roads and better quality gravel roads, while poorer quality and older minibuses and pickups are employed on roads in poor condition.

Long waiting times, and low frequency or absence of rural transport operations, implies the major problem is often a shortage of demand for services/ This in turn has a strong adverse impact on

[4] Although new vehicles are used, most vehicles imported into Sub-Saharan Africa are second-hand there are also large numbers of second-hand vehicles imported into Central America and the Middle East.

the prospects for rural development. Many low and medium density rural areas are therefore held in a 'vicious circle' of low demand, poor high-cost transport and poverty limiting the potential of new agricultural and other commercial opportunities.

Perhaps the biggest constraint to developing a better quality, more competitive and lower cost transport system for rural transport is the lack of demand. Cartels are more difficult to sustain where there is a high density demand and a dense route network. Likewise, the costs of vehicles, parts and fuel are likely to be lower, and service frequency will be higher where demand is high. A low density of demand, expressed in terms of GDP per unit area provides a rough indicator of countries most at risk from high cost and poor transport services. This is shown in Table 1 for selected countries.

Table 1. Selected countries showing GDP per unit area

Country	GDP/Area (US$ 000/sq. km)
United Kingdom	12,325
Sri Lanka	1,202
China	1,082
India	623
Uzbekistan	140
Nepal	134
Myanmar	95
Cambodia	93
Kazakhstan	80
Yemen	70
Bhutan	51
Laos	51
Papua New Guinea	37
Afghanistan	31
Mongolia	8

In the Asia- Pacific Region countries such as Mongolia, Afghanistan, Papua New Guinea, Lao PDR, Bhutan, Yemen and the other countries listed in the lower part of Table 1 have a low density of demand, and are therefore most likely to be at risk from high cost and poor transport services.

Challenges in financing rural transport services

There is a major knowledge gap in financing and running of rural transport services. For the most part the operations are part of the informal sector, where record keeping is rudimentary.

The informal sector tends to have limited access to collateral and bank finance. Due to its mobile nature, banks may also be unwilling to use the vehicle itself as collateral. This is because in many countries banks have no legal title to a vehicle for which a loan is made. In traffic law in these countries the registered owner is recognized as the person who keeps and uses the vehicle. In these cases banks have little power to repossess a vehicle in event of a default in repayment (Fouracre et.al. 1994).

McCormick et.al. (2013) found that in Nairobi, for informal operators with small fleets, funding typically comes from self, family or friends. Vehicle dealers and money lenders can also provide credit or take a stake in the business. In contrast, for larger companies managing many vehicles, funding came from banks and institutional investors. Although unstated, one would expect the low organization model, involving no bank finance, to be by far the most common model in rural areas. This is confirmed for a number of African countries by Starkey et.al. (2013)

A study in Pakistan found a very active and organized hire-purchase market for trucks. Approximately three-quarters of the privately owned fleet were bought on a repayment (or hire–purchase) basis. Although bank finance is the cheapest form of credit, operators complained that banks usually demand comprehensive insurance and demand legal entitlement to other assets besides the truck for a loan. These requirements create additional costs of compliance that discourage people from taking out bank loans.

The hire purchase arrangement will often be organized by a dealer in which repayments are specified over a period of typically between 40 and 60 months. From an estimate of the market value of the truck an implicit interest rate can be calculated. A very wide range of interest rates were calculated with the modal value between 16 per cent and 20 per cent; however, the interest rate was calculated to be over 60 per cent in 13 per cent of the cases. If the operator gets too far behind in his payments then the deal is presumed to be broken and the truck reverts to the dealer or money lender (Hine and Chilver 1991).

In Pakistan the widely available hire-purchase finance has enabled a much greater use of new vehicles, compared with Africa, and because of competitive pressure the overall reliability is better, and maintenance costs are lower than in Africa (Rizet and Hine, 1993).

There are exceptions on bank financing not being available. For example, in Thailand, the Government Savings Bank lends to individuals for businesses in general where there is strong family, social or village support. This decreases risk of default and leads to lower interest rates and down payment requirements.

In India, although buses account for half of all motorized passenger journeys they now account for just 1.1 per cent of vehicles, compared with 11.1 per cent in 1951. In a bid to improve transport in rural areas, the Indian Association of State Road Transport Undertakings proposed government support under the 12th Five Year Plan (2012-2017) for the purchase of 85,000 buses (50,000 new and 35,000 for replacement) (Times of India, 2012). However, it appears that this proposal was not taken up by the Plan.

In most low-income developing countries governments and aid agencies are reluctant to get involved, either through providing finance for vehicles, guarantee, or through providing service subsidies, in order to address the problems of poor service availability and high costs. The information base is weak, the industry has poor record keeping and markets appear fragmented. The publicly owned operators that exist tend to be very inefficient. There is also a natural concern over the political power of transport associations/cartels, the costs and logistics of regulating and monitoring transport in rural areas, and the strong possibility of corruption if subsidies are introduced. Public service obligations require thorough control of agreed service quality, and only independent organizations with representation by service users can deliver effective control of the service providers.

Financing models and approaches from the developed world

A range of approaches to improve rural transport has been suggested and introduced in different parts of the world.

Evidence from high-income countries relates mostly to passenger transport, as limited information is available on specific financing arrangements for movement of goods in rural areas. All high-income countries subsidize public transport[5], and all high-income countries provide some form of ambulance services for emergencies and often non-emergency medical transport. Some of the largest subsidies are provided for urban transit systems, however most countries do recognize the particular problems faced by transport in rural areas. Public transport subsidies can involve very large sums of money; for example, it was estimated that subsidies during the 1990's in the Netherlands amounted to the equivalent to 0.5 per cent of GDP (van Goeverden et. al. 2006).

There are many reasons for advocating transport related subsidies, including the promotion of economic growth, market failure, efficiency and environmental sustainability. Perhaps the most relevant and fundamental argument for rural transport subsidies is a recognition that everyone, wherever they live, should have the right to access to basic facilities and services. The 'right to transportation' is, in some countries, perceived as a civil rights issue, it is also enshrined in French legislation, in particular the law known as "LOTI" (i.e. Framework law on inland transport), passed in 1982: *"The progressive implementation of the right to transport allows users to travel in reasonable*

[5] This brief review has found evidence for public transport subsidies in Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

conditions in terms of access, quality and price, as well as in terms of the cost to public authorities, in particular by using a mode of public transport" (Saroli, 2015).

In the United States the Moving Ahead for Progress in the 21st Century Act (MAP-21) provided for US$608 million in FY 2014 for public transport in rural areas for residents who do not have access to personal vehicles. Funding is based on a formula that uses land area, population, and the number of low-income individuals residing in rural areas. The programme is seen as a lifeline for low-income working families, seniors, veterans, individuals with disabilities, tribal residents and others who cannot easily afford to travel to work and other destinations (US Department of Transportation, 2013).

In high-income countries, the majority of the adult rural population predominantly use privately owned motor vehicles to go to work, for shopping and to meet most of their travel needs. However, a significant proportion of the population – namely the young, the elderly, the poor and people with disabilities – do not have immediate access to a motor vehicle, and hence must rely on public transport. Many countries, such as the United Kingdom, provide subsidized or free transport passes for children and for people when they reach state pension age. Government funded school bus services are also common and people with disabilities may also receive transport passes and transport grants that can be spent on private means of transport or taxis. Transport may also be arranged for social and medical purposes, and for people to visit day care centres and clinics.

Besides this individual support, governments may also support public transport through subsidized fuel, 'bus grants' for the purchases of buses and even employment subsidies. Where the commercial market cannot support public transport services at reasonable frequency and cost, governments will intervene with extra subsidies, regulation and direct contracts to ensure minimum levels of service. In 2007-08 local bus service support in the United Kingdom amounted to £2,485m, equivalent to 0.18 per cent of GDP (Commission for Integrated Transport, 2008).

Bus companies may hold exclusive operating rights on popular (usually inner town) routes that also stipulate that they run on less well-patronized out-of-town routes. Local authorities can call for tender on contracts for particular routes, with specified service frequencies, where competing companies specify the state subsidy they require to operate. This may be calculated on a net basis (where the company also takes the fare revenue), or on a gross basis (where the fare revenue reverts to the local authority).

In recent years there has been increasing interest in providing more demand-flexible transport rather than fixed-schedule services. This can be in the form of 'community transport' for people who have difficulty using conventional services and 'demand responsive' transport whereby minibuses and shared taxis provide transport, on a door-to-door basis. These schemes can also be supplemented with ride sharing or carpooling, to match people on regular trips. Transport authorities should ensure that the different approaches do not conflict with existing regulations governing conventional taxi operations. A mix of different shared taxi and minibus approaches have also been run in the United Kingdom, France, Netherlands, Germany and Switzerland whereby the percentage of the overall cost to be met by subsidy, varies from 30 per cent (Taxi tub in France, Anruf Sammel Taxi in Germany) to 93 per cent (North Sunderland, United Kingdom) (Commission for Integrated Transport, 2008).

The main lesson from high income countries is not that subsidy schemes should be directly replicated in developing countries. Rather, governments should do their best to uphold the right of access to adequate transport for people and also formulate comprehensive solutions that both provide transport infrastructure and facilitate implementation of transport services.

Solutions for middle income and developing countries

Unlike middle-income countries, low-income countries are far less likely to have public transport subsidy programmes in place.

Sri Lanka

Table 2 identifies specific, explicit, public transport subsidies in Sri Lanka (Gwilliam 2005).

Table2. Public Transport Subsidies in Sri Lanka 2004

Wage Subsidies	LKR 1,280m (US$ 12.67m)
Uneconomic routes	LKR 188m (US$ 1.86m)
Scholar fare passes	LKR 196m (US$ 1.94m)
Costs of running Sri Lanka Central Transport Board	LKR 480m (US$ 4.75m)
Direct tire purchase	LKR 45m (US$ 0.45m)
Total explicit subsidy	**LKR 2,718m (US$ 26.9m)**

The total amount of explicit subsidy of US$ 26.9m was the equivalent of 0.13 per cent of GDP. Further hidden subsidies amounting to LKR 8250m (US$ 81.7m) were also identified. The identified subsidies relate to the 13 publically owned companies of the Sri Lanka Transport Board and additional "cluster companies", however these companies carry just 24 per cent of passenger trips, with the greater part of public transport run by private companies (Gwilliam (2005). Much higher subsidies (LKR 8.4 billion) have reported in 2011 by the Sri Lankan press.

For Sri Lanka the main justification for maintaining public ownership is that only these companies carry concessionary fare passengers and provide services not considered profitable. However, some have argued that, to achieve these social objectives, it would be better if a competitively tendered franchising system were introduced. Because if the private sector is more efficient then subsidy costs could be substantially reduced to achieve the same effect. Public sector companies tend to be heavily overstaffed and substantially unionized and thus are able to resist reform. Box 2 provides a case of Operating a 'Village Bus' in Sri Lanka.

However, the private sector, although not unionized, has route associations that are able, through the threat of withdrawal of services, to resist the introduction of new operators. There are also complaints about operators' poor behaviour (e.g. racing to stops, failure to pick school children when full fare paying passengers are waiting). Again it is argued that the solution is to introduce incentives in a franchising where behaviour is specified in the contract, and hence persistent failure could lead to the loss of the franchise (Gwilliam 2005).

Box 2. Operating a 'Village Bus' in Sri Lanka

An alternative approach to providing rural transport services is a community owned 'village bus'. Although there is anecdotal evidence of failure (i.e. people in the village run it for their own personal gain or disappear with the assets), the approach was tried in Sri Lanka with success. The Community Bus Project was set up with the help of the local International Forum for Rural Transport Development (IFRTD) in 1997. Some initial external finance was available but the bus generated an income, which kept it going and a replacement bus was purchased in 2008 (Centre for Poverty Analysis, 2009).

Malaysia

In recent years in Malaysia there has been a dramatic increase in both car and motorcycle ownership. This has led to a fall in patronage of scheduled bus services, and because important sections of the population do not have access to a motor vehicle the government is keen to ensure that a socially desirable level of service is maintained. As an interim measure a bus support fund of MYR 400 m (US$ 127 m) was set up. Under the National Land Public Transport Master Plan (Land Public Transport Commission 2013) the government's policy is setting up a system of competitive tendering and benchmarking. License terms will require that operators (or groups of operators) report against national benchmarking indicators such as operational performance, financial health and customer satisfaction.

Besides these measures, a 'dial a ride' system is also being considered for rural areas. This will provide access for recreation, shopping, education, medical services and social services for potentially isolated people. such as disabled, rural youth and the elderly. Initially two unit vehicles may be deployed for each local authority, a 31-seater minibus and a 14-seater van. The service will

provide door-to-door services for those who are unable to use conventional public transport because it is unavailable or because the individual has specific needs. An advanced booking system, through a call centre, is required. Flexible routing and scheduling using small and medium vehicles operating in a shared-ride basis is proposed. The operational costs will be partially covered by the fare collection. The scheme could be arranged through 'gross cost' contracts. It is estimated that the total cost will be MYR 410,000 (US$ 122,000) per local authority, or MYR 45 million (US$ 13.4 m) for the first year to set up the system[6].

Thailand

In 2008, to assist the low income population, the Thai Government introduced free rail and bus transport on selected routes. Free train travel was introduced for third class travel on 172 lines on the five main routes from Bangkok to different regions in Thailand. It is report that up to 2013, 160 million passengers have benefited with a total subsidy of THB 4.7 billion (US$ 145m). Free bus transport was introduced by the Bangkok Mass Transit Authority on 73 non-air conditioned routes all over the metropolitan area. Up until the 2013 the total subsidy was THB 10.5 billion (US$ 325 m). Although the rural population would have benefitted, the free transport policy was most focused on the urban poor, but conceivably could be expanded to rural areas. (Source, undated internet paper by Tansawat. T. et al.)

Philippines

In an attempt to cushion the impact of rising fuel prices the Philippines has introduced a targeted programme of fuel subsidies for jeepneys and motorized tricycles using smart cards, operating in both urban and rural areas. The drivers of both are relatively poor and it is estimated that there are over a million tricycles in use. It is expected that the measure will benefit both drivers and users (Layug 2014).

Rural freight transport assistance

It is very rare for governments to subsidies general rural freight transport. However, financial supports for farmers to purchase agricultural tractors and for crop marketing exist in some parts of the world. Provision of free (emergency) and subsidized food and other goods is also common. Also, in the post war period government owned agricultural marketing boards were widespread, and some element of freight transport assistance occurred through that channel.

In Malaysia, to assist the agriculture industry, the government provides assistance through grants and micro credit for farmers to buy motorcycle sidecars for moving produce. The project was started in 2011, and there were plans in 2014 to expand the programme to 1000 units. Working with the Farmers Association, the government of Malaysia is also involved in the collection and distribution of agricultural produce. There are 400 collection centres and 40 distribution centres, and farmers' markets are also supported. The government runs 750 small and medium trucks (2.5 to 12 tons) to collect and distribute produce. The rationale is that farmers will get a better deal through government intervention rather than relying purely on the commercial market. Currently the government controls less than 20 per cent of agricultural transport capacity. Private vehicles are hired, to collect the rice harvest, but the objective now is to increase government involvement towards 50 per cent of the agricultural transport market[7].

India has had a subsidy scheme in place since 1971 that promotes industrialization in remote, hilly inaccessible areas (principally in the north of the country). The subsidy covers the transport costs of raw materials and finished goods to and from the location of the industrial unit and a designated railhead. Depending on the Indian state, the subsidy rate is equal to 50 per cent to 90 per cent of the transport costs. The subsidy is specified as being eligible to an industrial unit for five years. In an undated (post 2009) Internet report, it was estimated that INR 24,390 million (US$ 380m) had been released under the scheme.[8]

[6] Source Author's personal communication with different government officials, 2014.
[7] Source: Author's discussion with different government officials, 2014.
[8] http://dipp.nic.in/English/Schemes/Transport_Subsidy/Transport_Subsidy_Scheme.pdf

Lessons and opportunities from road funds and other funding modalities

Road funds

Road funds effectively heavily cross-subsidies the rural road network from the fuel levies on vehicles travelling on the main roads. So subsidies to support rural transport are not new, and in many cases they are already built into the management of the road network. It is open to question whether the form and extent of these road maintenance focused subsidies provide the best result in terms of supporting rural accessibility and mobility.

During the 1990s and 2000s, a major effort, largely sponsored by the World Bank under the Road Maintenance Initiative (RMI), was made to address the problem of very poor road maintenance that had beset so many developing countries over the previous twenty years. An overtly commercial approach was adopted whereby 'second generation road funds' were introduced which had direct access to earmarked funding from fuel levies and a range of other charges. Under this model, which was introduced in a large number of African and Asian countries, the funding was designed to be entirely separate from the standard government budget sources, which the road fund could distribute to highway agencies and regional local authorities to pay directly for road maintenance (Heggie and Vickers, 1998).

The main rationale of the approach was the 'user pays' principle, so that road maintenance costs that were incurred by a vehicle could be recouped by setting appropriate fuel levies and vehicle charges. Although, the 'user pays' principle is economically sound in theory, in practice it only works for vehicles accessing the whole network, not for driving on a specific link. Because of the high annual fixed costs (due to the effects of weather) and the large difference in traffic volumes for different road types, there are large cross-subsidies between main roads and rural roads if charges are based on vehicle use (or, as for most road funds, on fuel consumption). For example, in Ethiopia it was found that, per vehicle kilometre, the routine and periodic maintenance cost of regional and district roads is around 18 times greater than a main paved road (Ethiopia Roads Authority 2004).

Many argue that fuel taxes should be used to help fund public transport. An example where fuel taxes are directly used to support public transport is the United States where fuel taxes go directly to the Federal Highway Trust Fund which, in turn, supports both highways and mass public transit programmes.

Output-based aid (OBA)

The Global Partnership for Output Based Aid (GPOBA)[9] located at the World Bank provides funding assistance to help poor people that are unable to access basic services because they cannot afford to pay the full cost of user fees. Output-based aid (OBA) (also known as "performance-based aid") is part of a broader donor effort to ensure that aid is well spent and that the benefits go to the poor. The aid is designed to cover a range of sectors (such as energy, water, and health) including the transport sector.

An OBA funded targeted subsidy scheme using smart cards has been trialed in urban Bogota giving the user a 40 per cent discounted fare (Mehndiratta 2014). OBA could be used to support the establishment of new rural transport services for the poor, although, it appears that so far, OBA has not been used for this purpose. As funding will taper off over time projects need to be designed such that they can generate enough cash flow to be self-sustainable. One key obstacle over the use of OBA is the relatively high initial funding threshold required in the application, which may inhibit the funding of initial low-cost pilot trials before a full programme is organized.

[9] https://www.gpoba.org/

CONCLUSIONS

This paper has argued that economic and social development of a large part of rural populations, especially in the developing world, is being held back by limited, unreliable or expensive access to markets and essential services. This problem is perpetuated by the continued bias against rural areas on the development of transport infrastructure, and the relative neglect of passenger and freight services operating on such infrastructure.

The level of transport services in many rural areas of poorer developing countries are low to non-existent, with the poor having to walk extensively to access transport services. Farmers need to pay significant sums for often-unreliable freight services. While the recent growth in motorcycle taxi services is a step forward, its access is limited to richer segments of the population and is also generally inaccessible to the elderly, the disabled, children, and nursing and expectant mothers.

In many countries with rural transport services, they are often expensive, of poor quality and unreliable. The supply of rural transport can be dominated by cartels, or inefficient publically owned services, and the lack of competition encourages excessive numbers of old inefficient vehicles, achieving low utilization in a limited market. Although there is no shortage of cheap second-hand vehicles to operate rural transport services, the informal sector that operates these services cannot get access to conventional bank finance. Funds are generally provided through family and informal connections, though there is a general lack of knowledge on the precise financial terms and arrangements. Overall the current management and funding of rural transport prevents the development of a competitive and efficient rural transport market, and as a result, a large part of the rural population does not have access to rural transport services, at a reasonable price and this limits their development.

For most of the poorer developing countries, road building and maintenance are the only forms of assistance provided for rural transport. Provision for transport services is very much left up to the informal market**.** In contrast, many developed and middle-income countries have significant subsidy programmes for rural public transport. For many countries there is an explicit 'right to transportation' (including rural populations) that is enshrined in law, and there are specific subsidy programmes for otherwise unprofitable services, which provide rural transport to benefit the poor, elderly, people with disabilities, and school children.

The absence of a well-functioning rural transport market (e.g. with transparent financing structures and performance based pricing) may dis-incentivizes the growth of rural transport services (and in particular, the funding of such services). A major contributor to this situation is low demand density, which is caused by rural poverty and dispersed settlement patterns and is exacerbated by bad roads and transport service monopolies. To address this situation, the following elements could help to improve rural transport services:

- There is a need to collect additional basic information about rural transport services, particularly on the availability, costs and financing to help assist with planning.
- New approaches to regulating and managing rural transport services are required, including the use of competitive service contracts and controlling the power of transport unions and cartels.
- Ways need to be found to incorporate rural transport services into government and donor rural infrastructure programmes.
- Appropriate subsidy schemes for rural transport services, (possibly involving competing for subsidies) need to be introduced particularly when, in the absence of subsidies, no services would be provided.
- Innovative use of Information and Communication Technology to support rural transport services (for example using smart phones and smart cards) should be explored.

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THE DISSEMINATION AND EMBEDMENT OF APPLIED RURAL TRANSPORT RESEARCH

J. R. Cook, L. Sampson, P. Starkey and C. Visser[1]

ABSTRACT

Rural road infrastructure and associated transport services facilitate efficient and effective transport. They are essential in providing reliable, affordable and sustainable access to essential services and markets for poor communities and under-pinning key Sustainable Development Goals (SDGs). Advances in relevant applied research can play a significant role in improving the effectiveness and sustainability of such infrastructure. However, barriers to the implementation of new research outcomes remain a major challenge to the application of new knowledge in the rural transport sector. One significant barrier may be the inherently conservative nature of infrastructure practitioners. However, it is very likely that it is the lack of focus on the dissemination, uptake and embedment of research outcomes within relevant policies, practices and procedures that hinders an effective application of insights. It is now becoming clear that undertaking and reporting research outcomes is not nearly sufficient to achieve the necessary improvements in rural access and rural transport services.

This paper reviews key points with respect to the sustainability of projects, the uptake and embedment of their outputs and it outlines possible approaches to overcoming the challenges inherent in the application of research.

INTRODUCTION

Rural transport and rural access can be directly associated with four of the recently adopted United Nations Sustainable Development Goal targets and indirectly associated with three others (Peet, 2015):

Direct Targets

- Target 1.4: Equal access to economic resources/basic services
- Target 2.1: End hunger and ensure access to safe, nutritious food
- Target 9.1. Develop regional and trans-border infrastructure
- Target 11.2. Provide access to safe and sustainable transport systems

Indirect Targets

- Target 6.1: Access to safe drinking water
- Target 12.3: Reduction of postharvest food losses
- Target 13.1: Climate change adaptation and mitigation

The ability of local engineers to identify problems and to devise solutions that provide sustainable cost-effective access for the rural poor is a key factor in the pursuit of the United Nations Sustainable Development Goals and their overarching aims of poverty reduction and socio-economic development. Applied research, capacity development, knowledge exchange and the uptake and embedment of innovative and cost-beneficial solutions are fundamental elements in this process.

In the course of the past 20 years, many multilateral and bilateral donors have supported research and knowledge transfer on various aspects of rural infrastructure, specifically with the aim of reducing costs and increasing the effectiveness of transport services for rural and peri-urban communities. Much of this targeted research has been particularly successful in the identification of innovative and unconventional approaches that can provide highly beneficial and cost effective solutions for low volume roads in the affected countries. However, it may be argued that less success has been achieved with the embedment of these approaches in policy and regulation such that the outcomes

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are sustained beyond the immediate timescales of the research programmes (Greening et al, 2010). The consequent fragmentation of research knowledge hinders the progress towards optimal provision of infrastructure and services for the road transport sector in the developing world as a whole (Sampson and Geddes, 2013).

THE CHALLENGES

BARRIERS TO UPTAKE AND EMBEDMENT

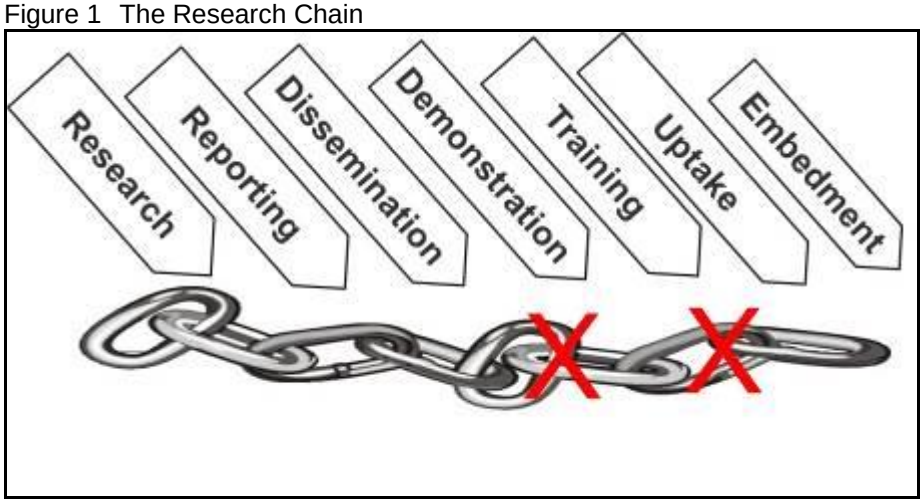
Resistance to the implementation of new rural transport techniques continues to be an obstacle to the application of new knowledge in the sector. While this may be at least partly due to the inherently conservative nature of the professionals in the sector, it is more likely the consequence of a lack of focus on following through from research output to embedment in policy. It would be unrealistic to expect rural transport planners, designers, contractors or service operators to shoulder the full risk of innovation solutions without the protection of an appropriate framework of relevant standards, specifications and regulations.

It takes a significant amount of time for any study to progress from research to full embedment. Most donor-funded initiatives do not last enough to realize the embedment of their research. The donor support phase usually has a limited time-frame, with the assumption that the "client" will be aware of the potential benefits of the project and will embed the initiatives into national policies and strategies as a matter of course. However, donors have an unrealistic expectation that the research they fund would be quickly adopted by recipients. Unfortunately, many initiatives, however potentially beneficial they may be to the recipient, often fall away within a relatively short period after donor support is withdrawn.

THE RESEARCH CHAIN

There is growing acceptance in the research community that it would be prudent to consider the whole research-embedment chain when designing and implementing a rural transport project (Cook et al, 2015). It has also become clear that undertaking research and developing likely solutions are not nearly enough. While previous rural transport research has delivered well in terms of output and adequately in terms of dissemination, it has performed less well thereafter down the chain. Figure 1 illustrates a typical rural transport research chain.

Figure 1 The Research Chain



The key links in a typical research chain are defined and reviewed in the light of recent research initiatives in Table 1.

Table 1 Research links and their issues

Link	Definition	Issues
Research	Undertaking a defined programme within a framework of Terms of Reference and Quality Management.	Usually well done with possibly some increased focus required on quality management
Reporting	Compilation of the research findings, analysis and conclusions.	Usually well done.
Dissemination	The knowledge transfer or distribution of the research outcomes to identified stakeholders.	Traditionally undertaken through workshops and distribution of hard copy reports, manuals etc. Requires an increased focus on electronic media distribution and use of local languages.
Demonstration	The validation of the outcomes through trials and monitoring.	Commonly incorporated in projects but with frequent questions marks as to the ongoing monitoring of assumptions and outcomes.
Training (Capacity Building	Instruction or guidance to key stakeholders or operatives concerned with wider application of the research.	In the past this activity has either been essentially an end-of-project action or short separate activity. Requires more in-project focus.
Uptake	The use or application of the research evidence at a major project level by practitioners and/or policy makers.	Generally not well addressed as an integral part of research projects.
Embedment	The formal inclusion of the research outcomes in Government policy, or mandatory standards, specifications and manuals.	Largely ignored as a project activity. Significant timescale problems.

ILLUSTRATIVE HISTORICAL CASE: VIET NAM RURAL ROAD SURFACING RESEARCH

Where there actually has been commitment to a completed chain from research into practice in live programmes, significant benefits of that research have been achieved, as evidenced by the Vietnam Rural Road Surfacing Research programme.

Between 1998 and 2013 the Ministry of Transport, Viet Nam (MoT) embarked on improving rural access as a support to the poverty alleviation programme. These phased rural transport programmes comprised rehabilitation or upgrading of thousands of kilometer of poor quality district and commune roads. Respective donors supported the Ministry of Transport in research and including innovation into projects. There were, however, significant concerns during phase 2 in 2000-2001 that predominantly unsealed roads constructed during phase 1 were not performing well and alternatives need to be researched to provide evidence-based data to enhance the decision making process for the provision of alternative surfacing for rural roads.

The benefits were achieved through evidence-based research programmes, feeding data into decision making processes. An example of this approach was the Rural Road Surfacing Trials (RRST) project, initiated in 2002. This project became part of the South East Asian Community Access Programme (SEACAP) in 2004 and continued through to 2009 producing significant amounts of performance data on gravel surfacing and a range of selected alternatives. The programme included increased focus on climate resilience and application in practice.

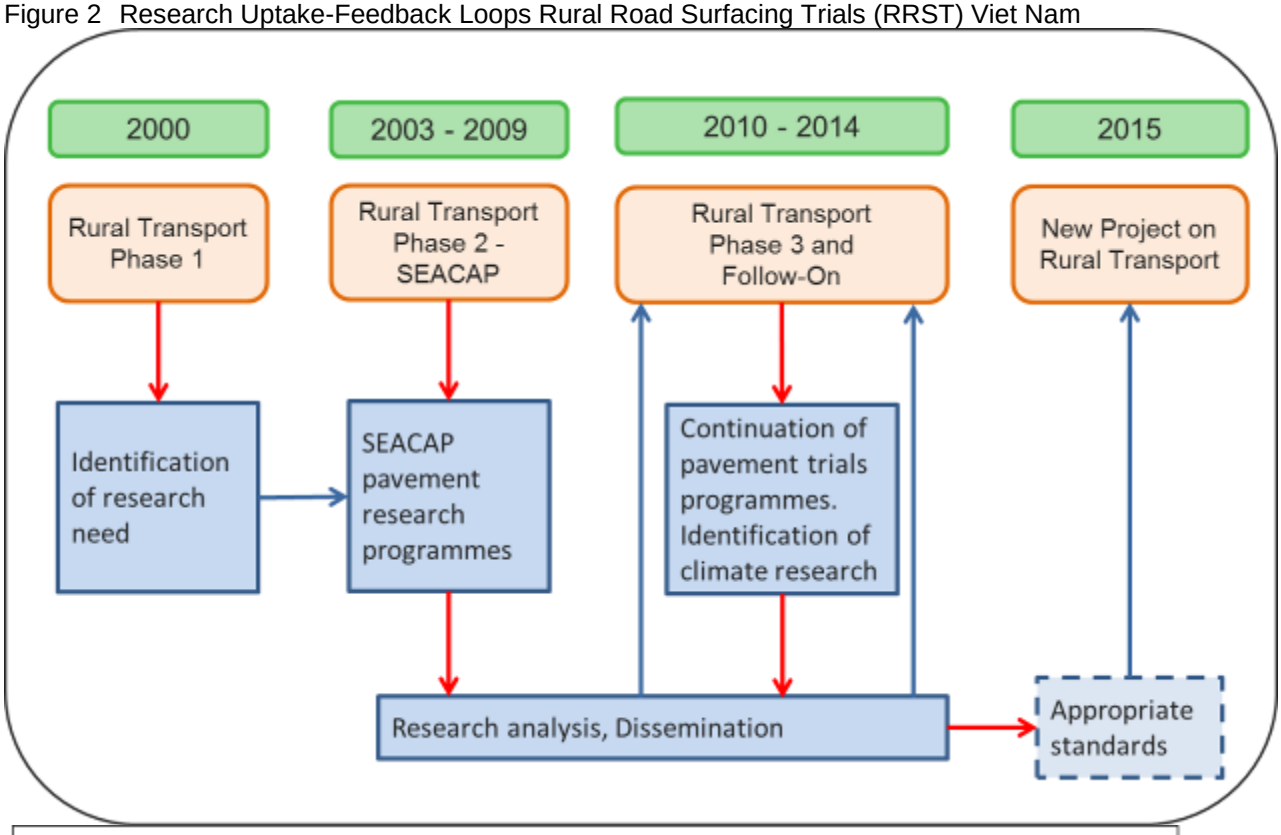
Key dates are the following:

- Research need identified 2000
- Research scoping 2001
- Funding secured 2002
- Research initiated 2003
- First trials completed 2005
- Monitoring 2005-2011

- Uptake by World Bank RT3 2007
- Uptake by regional programmes 2007-2015
- Feedback to further climate trials 2011-14
- Partially embedded in Viet Nam Standards 2015

Valuable lessons on the timescale of uptake and embedment may be drawn from the overall phasing of the RRST programme. These timescales are considerably in excess of what used to be normal timescales for in international funded research. The research uptake feedback loops are summarized in Figure 2. The benefits of the research has led to a shift from a network of 80 per cent unsustainable unsealed roads in 2002 to the provision of a network with 80 per cent sealed roads in 2014 that are much more sustainable and cost-effective with suitable management and maintenance interventions.

Figure 2 Research Uptake-Feedback Loops Rural Road Surfacing Trials (RRST) Viet Nam



The key lesson to be drawn from the multi-funded RRST work is that it is both essential and possible to achieve good "down-chain" success if donors and researchers adopt a more comprehensive view of the research aims and objectives. Fundamental to the ongoing success of this project was the guidance provided by an in-country stakeholder steering committee under the chairmanship of the Ministry of Transport of Vet Nam. Keeping stakeholder groups involved throughout the whole life of a research project is vitally important in terms of the continuity, ownership and direction (Sampson et al, 2014).

The current initiative, together with associated steering and executive committees, has taken these lessons on board and has focused efforts on achieving the uptake and embedment of applied research, rather than merely research dissemination.

KEY ISSUES AND PRINCIPLES

PROJECT SUSTAINABILITY

When the assumed post-project uptake and embedment does not occur, or fails, efforts on research and development initiatives go to waste. Even more damaging for vulnerable rural groups and poor communities are circumstances where improvements in livelihoods, which began under the initiatives, become undone when they fail. Focus on the application of evidence-based results of research in situations, where they can have significant and lasting impact, is an important component of rural transport research initiatives.

There has to be a framework for the effective application of research outputs. For example, the value of constructing pavement or surfacing research trials is strictly limited without the additional time being put into not only their monitoring and evaluation but into a framework within which they can be applied in practice. Hence, suitable rural road standards are essential to provide the context within which local resource-based pavement options may be assessed and selected for appropriate use. The key components of sustainability of research and its application are summarized in Table 2.

Table 2. Key sustainability factors

Component	Requirement
1. Politically supported	The research programme and its continuing development is compatible with an identified national policy driven by established government and is supported in all its aspects at the highest level.
2. Financially sound	Adequate funding in place for the establishment, staffing, resourcing and management of the research programme with a funding mechanism identified for long-term continuance and application of outcomes.
3.Technically appropriate	The research programme, its continuation and uptake are compatible with capacity of the relevant country institutions and staff. Its outputs are compatible with clearly identified national rural transport requirements and clearly identified technical needs.
4. Socially acceptable.	The research programme is capable of being embraced by and fostering existing social safeguards. There is clear focus on issues such as: community acceptance and participation, gender equality, and protection of vulnerable groups.
5.Instititionaly possible	The research programme has an institutional home with the necessary resources, knowledge and experience to carry forward the outcomes. This home must have a clear leadership and career progression framework with sufficient skilled managers and researchers.
6. Economically viable	The benefits accruing from a continuing research programme in terms of social and economic developments must be greater than its initial and on-going costs.
7.Uptake or Embedment Potential	There are practical arrangements through an appropriate Road Research Centre (RRC), university or Government Department for the review, adoption, acceptance and embedment of research findings into standards, specifications and every day operations.

Within the overall context of sustainability and research uptake DFID has identified four strategic issues that should underpin the planning of a sustainable research project:

1. Stakeholder Engagement; identification of relevant stakeholders and their context. Research must be tailored to meet user needs and structured to include ongoing discussion and engagement with stakeholders.
2. Capacity Building; Assessment of existing capacity shortfalls and implementation of a capacity building strategy.
3. Communication: Identify and design a communication strategy relevant both to the research aims and the stakeholder environment.
4. Monitoring and Evaluation: Ongoing gathering of data on uptake and adoption of a flexible approach to the research path.

PROVIDING INSTITUTIONAL SUPPORT FOR NATIONAL RURAL INFRASTRUCTURE RESEARCH

There is an overwhelming demand and compelling argument to improve accessibility of the rural poor in Africa and Asia to economic opportunities and social facilities through improvements to infrastructure and transport. The immediate focus is on strengthening the evidence base on more cost effective and reliable low volume road and transport services approaches, thereby influencing policy and practice. Donors and development banks have responded to this with the DFID funded Research for Community Access Partnership (ReCAP), which incorporated current programmes and past projects.

Recognizing that innovation of local solutions has greatly benefitted rural connectivity implementation programmes. Two recent programmes for the transport sector in developing countries are focused on applied research in the area of low-volume rural roads and transport services: the South East Asia Community Access Project (SEACAP) and the Africa Community Access Project (AfCAP). The former carried out applied research in low volume rural roads in Viet Nam, Cambodia and Lao PDR, while latter conducted applied research in low-volume rural roads and transport services with focus on seven countries – the Democratic Republic of Congo (DRC), Ethiopia, Kenya, Malawi, Mozambique, South Sudan and Tanzania.

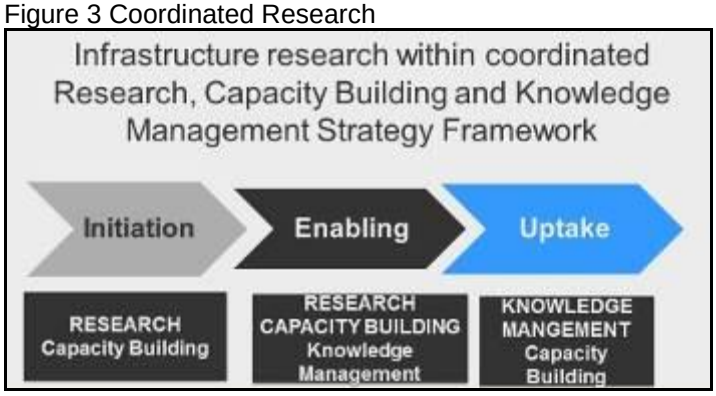
Building on the success of these two projects, a second phase of AfCAP and a similar applied research focused on South Asia, the Asia Community Access Partnership (AsCAP), were initiated in 2014. The programme focusses on high quality research and takes forward sustainability issues, in which the results of the research are adopted in practice and influence future policy in Africa and Asia.

A PROPOSED FRAMEWORK FOR THE SUSTAINABLE EMBEDMENT OF APPLIED RESEARCH IN THE FIELD OF RURAL TRANSPORT

Evidence from various donor-sponsored programmes suggests that in the development of an adequate framework for applied rural infrastructure research, greater focus needs to be put on the uptake of research into practical usage and embedment of the results of research into policies and standards. To maximize the likelihood that their research findings achieve sustainable outcomes, it is fundamentally important that a dedicated research uptake strategy will be planned and implemented in a proactive manner.

A key principle should be the Integration of capacity building and knowledge management into the framework of research projects as vital elements in achieving uptake and embedment. Capacity building and knowledge management must be considered and taken on board from the earliest concept and definition stages of a project, as shown in Figure 3. The Research for Community Access Partnership (ReCAP) has already incorporated these ideas into their activities and is currently striving for more effective means of research embedment.

Figure 3 Coordinated Research



Local problems need local solutions and knowledge transfer in the field of rural transport must not only respond to a clearly defined need, it must also be compatible with local transport environments.

Greater emphasis on regional and international partnerships serves to extend the impact of the research programmes beyond the limited number of partner countries. An example for this is ReCAPS's support to the African Road and Transport Research Forum (ARTReF) as a regional network of research centres. Establishing ARTReF has not only been important for the immediate implementation of ReCAP but also its future sustainability, including financial sustainability. Regional hubs such as ARTReF provide a mechanism to consolidate and utilize the fragmented information that has been generated throughout the region for better implementation (Sampson and Geddes, 2013).

RESPONSES TO SUSTAINABILITY, UPTAKE AND EMBEDMENT

A powerful response to the need to improve the management and delivery of embedded research is the adoption of a pro-active and holistic approach to the design of research projects. From such a perspective, all the relevant parts of the research chain (Figure1, Table 1) should be, where relevant, integral parts of the project and included in the terms of reference.

Achieving the aim of rural transport and transport services, research sustainability must be founded on ensuring not only the sustainability of individual research outcomes but more fundamentally on the sustainability of partner country research institutions to act as ongoing guardians and promoters of research with an established financing mechanism. An essential element of this is demonstrating the value of such research to partner country stakeholders through strengthening the evidence of the benefits of research by cost benefit analyses.

Key sustainability issues can be addressed using the following responses, which are currently implemented within the ReCAP system (Table 3).

Table 3 Responses to Key Sustainability Issues

Sustainability Component	Recommended Practice
Politically supported	All national level projects should originate from country partner organisations. All regional level projects should have buy-in from at least one country partner and be approved by the Regional Steering Committee (RSC).
Financially sound	Budgets are an integral part of the project concept assessment and approval system. Partner countries are expected to have a clear commitment, either in through financial or in-kind support. Figure 4
Technically appropriate	Each project should be defined through a short Concept Note (CN), subject to in-house PMU quality control. Larger projects are subject to RSC overview with the largest (>UK£500k) subject to Executive Committee Approval. All projects should be available for technical comments by an independent Technical Panel of experienced specialists. For larger projects this should be mandatory.
Socially acceptable.	There should be an emphasis in the Terms of Reference (ToR) and procurement procedures on gender balance. Other issues of socio-economic or environmental impact should be reviewed as part of the CN reviews.
Institutionally possible	The feasibility of the project should be reviewed as part of the CN and ToR quality check process and overviewed by the TP.
Economically viable	The economic viability should be an integral part of the review process. For many of the larger or more difficult projects there is a distinct initial scoping phase, sometimes separated contractually from any follow-on. This allows for a further review of economic, institutional and technical viability, including elements of cost-benefit analysis
Uptake/Embedment	The project design model should be built around the concept of a holistic approach to integrating research, capacity building and knowledge management into one programme, with uptake and embedment as key targets at national, regional and general Community of Practice levels. Where appropriate this should be contained within the CN and the ToR.
Stakeholder Engagement	Stakeholder engagement derives initially from the mandatory country partner origins of national projects and the required engagement in the development

	and implementation of regional projects. Stakeholder workshops and ongoing involvement of National Committees and RSCs should ensure active stakeholder engagement.
Capacity Building	Capacity building should be an integral part of all relevant projects and where appropriate specifically included within the CNs and ToR.
Communication	Apart from traditional hard-copy distribution of outputs, a wide variety of communication modes should be used. Through websites with freely accessible documents of participating subprojects and countries, quarterly e-Newsletters, social media (Twitter, Facebook and Linkedin) as well as dedicated online user forums, insights can be disseminated.
Monitoring and Evaluation	The developed logical framework should be the primary tool to be used for high level monitoring of the programme as a whole. All technical projects should be assessed for their contribution to meeting the logframe targets. The TP should have an important oversight role in monitoring outputs.

ILLUSTRATIVE EXAMPLES

ECONOMIC GROWTH THROUGH EFFECTIVE ROAD ASSET MANAGEMENT

This is a regional project whose purpose is to achieve economic and social benefits for local communities in rural areas as a result of improved performance in road asset management. Although a designated regional project, it is closely associated with stakeholders in three partner countries and one resource-demonstration country (South Africa).

The project provides technical assistance to achieve improvements in asset management performance on a selected network of rural roads within each participating country. The performance will be measured against a new framework for rural road asset management that is being developed as part of the study. Measurements will also be taken of the road network condition and the impact of the road condition on the rural economy. Meetings with stakeholders will be used as part of an influencing and peer review strategy to achieve improvements to the management of rural roads and build a maintenance culture.

The approach to the project seeks to foster self-reliance in road agencies in the project areas and encourage greater accountability to road users and other sector stakeholders. It provides flexibility and space for the participating road agencies and their stakeholders to determine their own project outcomes.

A cornerstone of the approach is assisting each participating area to analyze the strengths and weaknesses of their own road asset management systems and propose modifications and improvements at all levels. The findings of the project data collection will be discussed with sector stakeholders locally and in a wider project implementation team involving other AfCAP countries. Agreed outcomes and relative performance measurements will be disseminated.

This project illustrates the application of the following key principles:

- A regional project based on detailed requirements of participating country partners – strong political support.
- A project firmly focused on stakeholder needs – technically appropriate.
- Project aims that include planning for post-project sustainability – uptake and embedment
- Active involvement of stakeholders throughout the project – communication
- Ongoing stakeholder engagement through the PIT and local discussion groups

GENDER MAINSTREAMING IN RURAL TRANSPORT

This research cluster programme, which originated from research in the fields of gender mainstreaming and rural transport, commenced in October 2015. Discussions were facilitated using websites, social media and email, with a view to identifying relevant research topics for further exploration. Four research themes were developed by participating stakeholders:

- Transformative impact of gender mainstreaming at household, community and national levels.
- Transformative impact of gender mainstreaming within rural transport institutions.
- Potential for gender-focused rural transport initiatives be scaled-up and mainstreamed and importance of rural transport policy.
- Methodologies, analytical frameworks and indicators to monitor effective gender mainstreaming in the rural transport sector.

A call for research concepts was issued in January 2016. It resulted in thirty-four responses from participating stakeholders, which were evaluated in March 2016 and, ultimately, seven research concepts were selected for full proposals. Together, these will involve a range of research themes, including research on gender mainstreaming in eight countries in Asia, West Africa and Eastern Africa. All will be implemented by gender-balanced teams, with African and Asian researchers involved at a senior level.

This project demonstrated the application of the following principles:

- Use of social media (effective communications)
- Involvement of stakeholders for project inception
- Gender focus
- Inter-linked research (knowledge transfer)
- Use of gender balanced teams
- Ensuring African and Asian researchers take responsibility for the research
- Rural transport and vulnerable groups

SUMMARY OF WAY FORWARD TO UPTAKE AND EMBEDMENT

The previous research initiatives on rural transport in Africa and Asia alike, have been assessed as being highly successful in their production of high quality research in the areas of low volume rural roads and, to a lesser extent, in rural transport services. Significant further room for improvement has been identified within the crucial process from research dissemination to uptake and embedment. The key lessons from the analysis of these projects are the following:

- It is essential to establish a home for the research in each partner country, which acts also as a focal point for knowledge management and transfer.
- Undertaking and disseminating research is not enough – this must be seen only as an interim step towards uptake and embedment.
- Research, capacity building and knowledge transfer should not be seen as separate activities. It follows from the previous point that projects must be more focused from the very start on the prioritized targets of uptake and embedment.

In moving on from the initial programmes donors have to take a much more proactive view of uptake and embedment. The achievement of uptake and embedment are key indicators within the programme logframe and at a project level these issues need to be included within individual research terms of reference.

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