Complementing infrastructure: enhancing rural mobility through motorised and non-motorised transport

Paul Starkey

Animal Traction Development, Oxgate, 64 Northcourt Avenue, Reading RG2 7HQ,UK

Abstract

Poverty alleviation requires improved mobility so women and men can access daily needs, services, markets and income. Transport budgets are biased towards infrastructure. An integrated approach requires complementary transport (motorised and non-motorised) and infrastructure. Diverse transport technologies exist and can be used together: bicycles are very flexible, animal power is sustainable, pickups are suited to low-density routes, and trucks carrying large loads are cost-effective. In many areas, water transport is extremely important for personal mobility and moving produce. Efficient rural transport systems are multi-modal, involving long-distance large motorised transport and intermediate means of transport for village and 'feeder' transport.

Important stakeholders in rural transport are users, operators, support services, regulators (national and local government), several ministries, credit agencies, institutions and NGOs. Users differ widely (income, gender, power). Transport associations often reduce competition, causing inefficiency. Uneven patterns of transport technologies exist, relating to population density, income, environment, culture and local invention. Women generally have less access to transport. In low-density (remote rural) areas, vicious circles of scarce transport, insufficient users and inadequate support services hinder development. In high-density areas (rural markets, peri-urban, transport hubs), transport demand encourages virtuous circles of diverse technologies and critical mass of users and services creating improved mobility, economic activity and efficient transport. Markets act as important transport hubs, allowing loads to be consolidated and dispersed. Factors influencing the efficiency of rural transport services include: economic demand, cost of inputs, competitive markets, critical mass (users, providers, support services), infrastructure, a range of affordable technologies, credit, regulatory environment, culture and gender influences.

Rural transport initiatives require holistic, user-focused, gender-sensitive approaches to improving infrastructure and transport services. Local limiting factors, priorities and suitable options should be determined with stakeholders. Most countries contain high, low and intermediate density areas, which need different approaches. Low-density situations require more promotion, credit and market-related initiatives. Short-term political and economic objectives favour 'high-density' situations. Poverty-reduction, equity and development goals encourage interventions in 'low-density' areas. Low demand should be addressed through rural investment and employment, well-located markets (allowing intermediate means of transport), feeder transport, interconnected infrastructure and communications. Multi-modal rural transport systems are needed with additional motorised and non-motorised services, efficient hubs and good links between transport types (including water transport). Intermediate means of transport can be increased with improved supplies, credit and resource concentration to develop a critical mass of users and trained support services. Stakeholders should be involved in determining quality and quantity controls and enforcement. User associations should be formed and anti-competitive practices discouraged. The capacity of institutions should be strengthened, including training in intermediate means of transport, participatory processes and gender analysis. National and international networking should be supported.

Introduction

This paper summarises some key findings from the document '*Improving rural mobility: options for developing motorised and non-motorised transport in rural areas*', published by the World Bank. Paul Starkey, Simon Ellis, John Hine and Anna Ternell prepared this in collaboration with professional colleagues in many countries. This present paper highlights some of the observations and conclusions, but readers are referred to the larger publication for more details, many examples and references to all sources (Starkey et al, 2002).

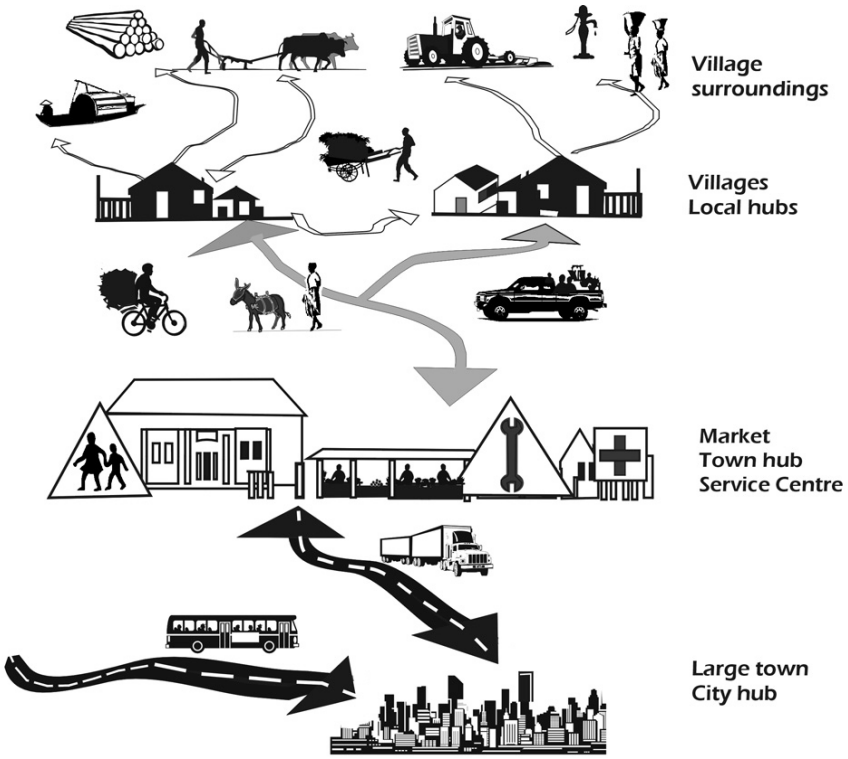
Mobility and the nature of rural transport

Poverty alleviation requires less isolation, improved mobility and greater access, achieved by complementary transport and infrastructure. Improving rural mobility is essential so that women, men and children can easily obtain daily needs (water, food, fuel, housing), access services (education, health, finance), reach markets, gain income and participate in social, political and community activities. Transport investment has concentrated on infrastructure, neglecting transport services. This bias still exists in national and donor budgets. An integrated approach is needed to infrastructure and motorised and non-motorised transport.

Rural transport involves different movements, people, purposes and technologies. Land transport generally receives most attention, but rural water transport can be very important. Between walking and carrying and large-scale motorised transport (cars, trucks and buses) is a range of intermediate means of transport (IMTs), including bicycles, motorcycles, carts, animal transport and small boats. These increase transport capacity and reduce drudgery at relatively low cost. Even so, they may be unaffordable or unavailable, particularly to rural women who may have low incomes but high transport burdens. Expensive rural transport and poverty form a vicious circle. Lack of mobility restricts income generation and economic demand; low demand constrains the provision of cheap transport and the use of intermediate means of transport, and this lack of affordable options restricts mobility.

Efficient rural transport systems involve complementary large- and small-scale transport modes operating to and from 'hubs' within villages, market centres and towns. Intermediate means of transport are important for on-farm, within-village and village-to-market transport and short urban and peri-urban movements. With higher transport demand, larger motorised vehicles are justified, particularly on the rural-urban linkages. Trucks, buses, trains, planes and vessels depend on local 'feeder' transport for consolidation and dispersal of passengers and goods. This occurs at the transport hubs (markets, village terminals, lorry parks, stations and ports). Figure 1 illustrates such hubs and transport modes.

Figure 1. A rural transport system *(Source: Starkey et al, 2002)*

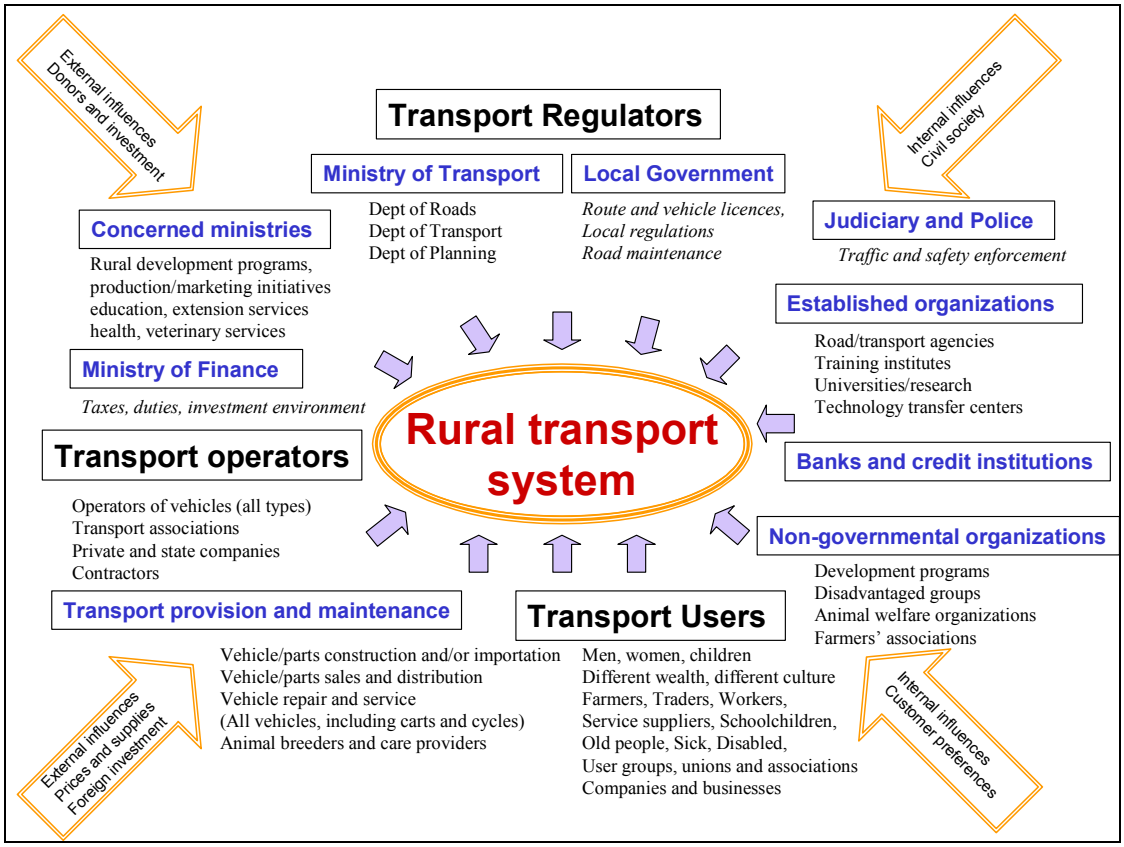


Issues affecting rural mobility

The wide range of stakeholders

Many different stakeholders influence the provision, price, quantity and quality of rural transport operations. Among the key players are the users (or potential users), operators (freight and passenger, large and small, formal and informal, personal and service) and the regulatory authorities. Some of these are illustrated in Figure 2.

Figure 2. Some of the stakeholders in rural transport systems *(Source: Starkey et al, 2002)*



Transport users differ by income, occupation, age, gender and socio-cultural characteristics. These influence their needs and preferences.

There are gender differences in transport tasks and access to technologies. Transport programmes have generally neglected the special needs of women. Most transport is owned and operated by men. Gender power relations and unequal access to money restrict women's mobility. Women can be empowered by greater mobility. Access to means of transport can cause gender roles to change.

The elderly, the handicapped, the sick and the very young have particular problems relating to mobility and access**.** Such people may benefit from specialised transport technologies or simple adjustments to conventional vehicles. With increasing life expectancy, survival rates and aspirations, such special requirements are likely to increase in importance.

Transport users rarely form associations and so their voices are little heard. Users should form groups to encourage competition, appropriate regulation and to demand better services and fairer prices.

Transport regulators are mainly national or local governments that regulate motorised transport through licenses, inspection, routes and fares. Some governments or local authorities also regulate

intermediate means of transport such as animal-drawn vehicles and human-powered taxi services (rickshaws, tricycles). Regulation can improve standards, but is of limited value without promotion and enforcement. Many regulatory authorities are weak and fail to create a favourable environment for transport operators. Effective regulation, combined with education and enforcement, can support transport systems with quantity controls (to match demand and supply) and quality controls (to ensure safety for passengers and road users as well as animal welfare). Regulators should provide a favourable environment for appropriate intermediate means of transport.

Transport operators often form associations for self-regulation, determining prices and minimising competition. This is true for both motorised and non-motorised transport. Transport associations can improve professionalism, vehicle maintenance, business management and competitive services without causing market distortions. Associations that regulate fares, routes and queuing, with the intention of protecting their members tend to reduce free competition, so inducing and sustaining inefficient operating practices. They need persuading that competition increases vehicle utilisation, operational efficiency and customer satisfaction.

Institutional stakeholders and supporting services may be extremely important in the development of efficient rural transport services. Several ministries influence rural transport, including finance (determining duties and fiscal policies) and agriculture (promoting rural production and marketing). Other key stakeholders include support services (manufacturers, importers, retailers, workshops, artisans), infrastructure contractors (large and small), banks and credit associations, training organisations, professional associations and NGOs. Depending on the circumstances, many of these stakeholders can play important roles in the efficient provision of rural transport services. For example, in a major investment to improve access to rural transport in Madagascar, the key players will actually be the users, NGOs, suppliers and credit agencies (Starkey and Rasamoela, 2002).

Many internal and external factors influence the various stakeholders in relation to transport, including economic forces (local economy, world prices, exchange rates, investment), donor policies, and socio-cultural issues (changing customer needs, preferences and the nature of civil society).

Population densities and income levels

Lessons emerge from contrasting two transport demand and supply patterns. A ‘low density’ scenario exists in much of rural Africa, remoter areas of Latin America and Asia and many mountain areas. These have low populations, traditional agriculture or herding but little paid employment, undeveloped markets and poor infrastructure. Infrequent vehicles carry both passengers and freight, but travel is expensive, crowded and unsafe. Motor transport is barely viable, due to high costs and low economic demand. Changes are slow, with poor economic activity, material availability and information flow. Transport demand and cash flows are seasonal. Transport diversity is low, with little competition and no ‘critical mass’. A vicious circle of scarce transport, insufficient users and inadequate support services hinders development.

‘High-density’ situations are found in all regions, particularly around rural markets and in peri-urban areas. The high density of transport is often associated with medium to high populations, irrigated agriculture (reduced seasonality), cash crops, efficient markets and non-agricultural employment. Transport infrastructure is adequate, services have reached ‘critical mass’ and it easy to buy and maintain motorised and non-motorised transport. Innovation and adoption are rapid, with high economic activity, material availability and rapid information exchange. Diverse transport types are widely available, albeit with overloading, poor safety and little regulation. Infrastructure is not designed for intermediate means of transport. With road congestion, motorists try to prohibit small vehicles (human, animal, motorcycle).

Most developing countries have some areas of high transport demand, and others of low demand and a continuum of intermediate conditions. Transport strategies should recognise such variation, so that appropriate interventions are targeted in the different circumstances.

Critical mass of users, operators and suppliers

Factors influencing the efficiency of rural transport services include: economic demand, cost of technologies and inputs, competitive transport markets, a critical mass (users, providers, support services), appropriate infrastructure, availability of a range of affordable transport technologies, socio-cultural influences and an appropriate policy and regulatory environment.

The concept of 'critical mass' is crucial to the understanding of adoption and use of transport technologies. It is difficult sustain transport technologies when few are used. Transport technologies, motorised and non-motorised, require supporting infrastructure for their manufacture, supply and repair. The 'early adopters' have to obtain and maintain their transport devices without local technical support. Such support services do not develop until there is a good market. It is difficult for a critical mass of adopters to develop without the support services, while sustainable support services are unlikely to develop in the absence of a critical mass of users. Once a 'critical mass' of users exists, the technology may expand rapidly, and operators (motorised and non-motorised) will have a choice of service providers for purchases and repairs (Starkey, 2001).

Patterns of adoption and use of transport services

The patterns of use of transport technologies are uneven and vary according to differences in population, incomes, cultures, topography, climate, farming systems and transport needs. Certain paradoxical patterns are attributable to local inventiveness, entrepreneurship, preferences, fashions and chance circumstances. Most transport technologies have spread through private sector initiatives, often at a very small scale. Some public sector campaigns to promote particular means of transport have been successful, but others have had negligible impact. The conditions favouring adoption should be understood so conducive policy environments can be created.

Complementary and competitive services

Diverse transport technologies are available with unique combinations of cost, complexity, manoeuvrability, load, speed, range, durability, convenience and aesthetic characteristics. Each has different requirements for infrastructure, energy (human, animal, motor), foreign exchange and supporting services (mechanical, artisanal, veterinary, financial and informatics). All have advantages and disadvantages, which may differ with the user's gender, age and characteristics. High demand around transport hubs encourages a high diversity of complementary transport technologies, each fulfilling a different 'niche'.

Walking and carrying can be appropriate for small loads and short distances. This is the only realistic option in some situations (eg, muddy slopes). Handcarts and barrows are useful for short journeys (collecting and itinerant selling). Bicycles are the most available, affordable and flexible means of transporting people and small loads for short distances. They are increasing in most areas. Animal transport is often appropriate and affordable in rural areas where animals have multiple functions and feed resources are available. Motorcycles are relatively expensive but provide convenient, fast and flexible light transport, and in some countries they are increasingly used as simple taxis. Motorcycle trailers and three-wheelers (widely used as taxis in Asia) require good roads. Four-wheel tractors are complicated machines for traction in poor terrain. In Asia, trailers pulled by power tillers are important for local rural transport. Pickups have the size, speed, flexible load potential and performance on poor roads to make them suitable for the long-distance transport needs of small, dispersed communities. Large trucks and buses are very cost-effective when carrying full loads over large distances, and costs per tonne-kilometre can be very low. The same is true for bigger boats and barges, but, as with land transport, large-scale transport requires large loads for economic viability.

Although these different technologies may be in competition where their services overlap, they are often complementary, and mutually reinforcing. Where efficient complementary services develop (eg, small 'feeder' transport serving long-distance transport hubs), the whole transport 'market' can expand, reducing costs and benefiting all users and operators.

Issues relating to cost

People want mobility but need to pay for it. Most transport devices generate income, save time or assist profitable ventures. Adoption of intermediate means of transport often depends on income-generating opportunities. The value of time lost through poor transport is underestimated. Better transport can result in lower marketing costs, more efficient agriculture and less wastage of produce. Changes in farm production due to road infrastructure have been disappointing due to lack of competitive transport services (Ellis and Hine, 1998).

There are big differences within and between countries in the price of transport. With the notable exception of animal transport systems, rural transport costs more than the equivalent urban transport. Thus rural motor services are expensive, as are bicycles in rural areas. Operating costs depend on vehicle utilisation, cost, maintenance, fuel and the transport market. Competitive markets encourage low cost practices. It is easier to obtain high levels of utilisation in high-density areas. In Africa, levels of utilisation of transport devices, including trucks, tractors and ox carts are relatively low. Motorised and non-motorised transport is expensive in most of Africa, due to the low density of demand, low utilisation (affected by cartels), poor operation, maintenance and operator training and high costs of vehicles and components (low competition) and fuel. Some remote areas of Latin America and Asia suffer from similar problems.

Promoting rural mobility

Setting priorities and policy choices

Priorities must be set to target resources and interventions according to local needs and policy objectives. Short-term political and economic objectives will favour 'high-density' situations. Poverty-reduction, social equity and long-term development objectives encourage interventions in 'low-density' areas. All situations require participatory processes that involve all stakeholders in prioritising, planning and implementing transport solutions.

In targeting resources, policy makers and planners need to:

- have detailed knowledge of local needs
- understand the diverse and changing perspective of the many stakeholders
- understand conditions that influence rural transport services including the social factors
- jointly identify limiting factors that can be addressed at an acceptable cost and timeframe
- understand which members of society will benefit most from possible interventions
- transparently address the inevitable conflicts of interest
- set priorities according to agreed local concerns and requirements.

To achieve this, transport programmes should

- adopt a participatory approach that involves all stakeholders
- develop a database of stakeholders
- critically review local experiences and past initiatives
- critically review international experiences and consider adapting relevant 'best practices' to local situations
- develop shortlists of suitable options (technologies, organisational systems, infrastructure)
- adopt a holistic planning approach (multi-modal, multi-sectoral)
- prepare decentralised programmes with a range of distinct, locally-targeted initiatives.

Tools that will assist this process include:

- decentralised workshops of stakeholders to allow rural participation and highlight regional differences in priorities, technologies and organisational systems.
- self-critical monitoring/evaluation of present and past initiatives
- formation of an active national network linking all stakeholders
- links with comparable programmes in other countries and international networks.

As a result of these processes, many different options are likely to emerge and a range of unique local programmes will be developed. Among the main areas to be addressed will be increasing transport demand, stimulating complementary transport, regulating transport services and capacity building in all sectors.

Addressing low density of demand

The vicious circle of scarce transport, insufficient economic demand and inadequate support services must be addressed. This is particularly important in remote, low-density areas. Existing dispersed demand should be amalgamated into economic loads at transport hubs using feeder transport (particularly intermediate means of transport). Rural markets are essential transport hubs where loads can be both consolidated and dispersed. When appropriate, a system of rural markets should be developed. Markets should be in strategic locations and spaced by distances that allow local communities to access them using intermediate means of transport. Inter-modal links, such as jetties and access roads linking water and road transport, should be developed or strengthened. Increasing route inter-connectivity avoids 'dead ends' and improves the efficiency of transport services. Better communications and information systems can improve the efficiency of markets. Transport brokers can help consolidate loads and match transport demand and supply.

Greater transport demand can be stimulated through schemes to stimulate employment, economic activity and agricultural production. Such initiatives require a coordinated, integrated, participatory approach with complementary investments involving government (different ministries and levels), the formal and informal private sectors, local financial institutions and NGOs. A virtuous circle of improved transport and marketing leading to greater production and more transport may be stimulated in a number of ways. Promoting market depots as transport hubs accessible by intermediate means of transport can prove successful in raising agricultural production. The use of labour-based methods on rural roads can stimulate local economic activity, transport and productivity. Agriculture departments should promote appropriate multipurpose power sources that can be used for farm work and transport (animal traction, power tillers, tractors).

Increasing rural credit and purchasing power should stimulate demand for, and supply of, transport services. Credit can be very important in expanding the use of intermediate means of transport. Credit provision can assist production (or importation), distribution, rural supply and purchase of transport technologies. Existing credit programmes for agriculture and small industries can be expanded to cover the supply and purchase of transport devices. Credit programmes should consider the specific needs of women.

Subsidies distort markets, but they may help establish transport services in poor, low-density areas. Authorities may use subsidies to stimulate services where transport provision is below what they (and the local population) consider to be minimum standards for that area. In such cases, operators may bid competitively for the market. Subsidies to the formal sector or imported products may cause unfair competition to the informal sector or indigenous products. Reducing taxes and duties can increase demand for both motorised and non-motorised transport (including bicycles), but it is difficult to target benefits specifically for rural areas.

Stimulating complementarity and promoting multi-modal rural transport systems

Efficient rural transport requires a multi-modal system based on intermediate means of transport, motor vehicles and (where appropriate) water transport. Good infrastructure is essential for good, cheap transport. However, holistic planning is required to ensure that infrastructure and means of transport are complementary. High road standards involve expensive opportunity costs, but spot improvements are cost-effective. High returns can come from simple tracks and small bridges, designed for light vehicles and intermediate means of transport. Many rural journeys start or end in towns, and clearly-defined, competitive urban terminals can improve rural services. The same is true for water transport and good, easily accessible interchanges between the transport modes are vital. Separate lanes for intermediate means of transport may be appropriate in busy locations. Strategies

should address mobility and infrastructure as an integrated solution, with complementary motorised and non-motorised transport operating on roads and waterways.

Transport planners tend to think mainly in terms of motorised road vehicles. However, lack of small-scale local transport often inhibits the success of motorised transport systems, constraining production, market efficiency, reliability and the quality of rural life of rural people. Programmes should encourage vehicle diversity and actively promote intermediate means of transport, including bicycles. Stakeholders need information on technology choices appropriate to local conditions. Incentives for adoption may be required, particularly credit.

In promoting intermediate means of transport, it is advisable to work with private sector suppliers and concentrate resources to ensure a sustainable 'critical mass' of transport technologies and support systems. It may be pragmatic to test new technologies and systems around markets where the year-round transport demand and availability of materials and repair facilities will help create a critical mass of mutually-reliant users and support services. If the introduction is successful, this will improve prospects for subsequent promotion in a more remote and less supporting operating environment.

Low use of intermediate means of transport in remote areas is often associated with poor supply systems, weak support services and lack of entrepreneurial service providers. Rural supplies of bicycles, axles and components may be improved by support to rural enterprises combined with credit for stock, business training and help in sourcing lower cost inputs. Supply-side promotion may fail if it advocates specific technologies (rather than a range of options) or fails to distinguish between people's aspirations and realistic economic possibilities.

Regulation of transport and support to the private and NGO sectors

Regulatory authorities (national and local) stimulate the operation of efficient, safe and affordable rural transport services provided by private owners and operators. Creative competition and the absence of corruption in the transport sector should lead to greater quantity and quality of all transport types and services. Private suppliers, operators or workshops should not face unfair competition from subsidised vehicles or services provided by development programmes. Users of intermediate means of transport should not be marginalised by unreasonable prohibitions, but appropriate infrastructure (reserved lanes, parking and loading facilities) should be provided to facilitate their efficient, integrated use.

In the rural sector, quantity controls, to match supply and demand, are likely to be based on stimulating additional services, and increasing service frequency by reducing the practice of queuing for full loads. Quality controls and regulations should be developed in collaboration with relevant stakeholders, and should address safety, health, comfort and welfare standards for the range of vehicles and operations. Enforcement should be arranged in cooperation with relevant civil society organisations (user associations, operators, NGOs and animal welfare groups). Regulation and enforcement is easier to achieve in the more favourable, high-density situations, where economically viable services exist, but which can be improved with emphasis on safety and fair competition.

By joining together and forming lobby groups, users can increase their influence and bargaining power with regard to transport operators and the provision of appropriate infrastructure by local authorities. Proactive user groups should therefore be encouraged to demand improved services and facilities. Transport associations should also be encouraged, but they should be persuaded to avoid restrictive practices and promote fair competition.

There is need to strengthen the capacity and understanding of all organisations involved in rural transport planning, regulation and implementation, so that stakeholders are included, lessons learned and a conducive environment for rural transport operations created. Politicians and the transport professionals must be made aware of the need for complementary motorised services and intermediate means of transport. Governments, supported by donors, should provide training and capacity building for local experts in all sectors and at all levels in key issues including intermediate means of transport, participatory processes and gender analysis. Positive images of complementary transport modes should be presented through education and the media.

National networks should be formed and supported by users, operators, NGOs, governments and donors. These networks should develop active programmes to link stakeholders, build local capacity and share the lessons of national and international experiences. Networks should encourage pilot initiatives and innovations. International networking exchanges should be supported.

Acknowledgements

The author would like to acknowledge Simon Ellis, John Hine and Anna Ternell who were co-authors of the World Bank publication that forms the basis for this paper. He would also like to thank the many people who participated in the various review processes, including officials and members of the International Forum for Rural Transport and Development (notably Priyanthi Fernando) and staff of the World Bank.

References

Ellis S D and Hine J L, 1998. *The provision of rural transport services: approach paper.* SSATP Working Paper No 37. Sub-Saharan Africa Transport Policy Program (SSATP), The World Bank, Washington DC, USA. 64p.

Starkey P, 2001 *Local transport solutions: people, paradoxes and progress.* SSATP Working Paper No. 56. Sub-Saharan Africa Transport Policy Program (SSATP), The World Bank, Washington DC, USA. 74p.

Starkey P and Rasamoela L 2002. Investing in intermediate means of transport in Madagascar. Paper prepared for the PIARC (World Road Association) International Seminar on 'Rural transport: key element of development' held 15-16 May 2002, Siem Reap, Cambodia.

Starkey P, Ellis S, Hine J and Ternell A, 2002. *Improving rural mobility: options for developing motorised and non-motorised transport in rural areas*. Technical Paper. The World Bank, Washington DC, USA. (in press).