On the move in rural areas

An integrated and inclusive approach to rural transport operations

Initial draft paper

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The opinions expressed in this paper are those of the authors. They do not necessarily represent the views of the organisations responsible for the contract (Carl Bro, Transport Research Laboratory and Animal Traction Development) nor those of the Rural Transport Thematic Group of the World Bank for whom the document was prepared.

Authors' cautionary note

This is a draft document that has not yet gone through the processes of professional peer review and detailed text editing. Its limitations are acknowledged. Please do not quote from it, except in the context of the review processes.

The authors would warmly welcome feedback, corrections criticism and suggestions. Please forward your ideas to one or more of them, at the addresses provided below.

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Preface and acknowledgements

The Rural Transport Thematic Group of the World Bank commissioned this paper, following an initiative of Jerry Lebo and Dieter Schelling. Danida (Danish International Development Assistance) provided funds for the work and the Carl Bro Group (Denmark) was awarded the contract. Anna Ternell (Carl Bro) was responsible coordinating the work. The detailed writing was mainly undertaken by Paul Starkey (Animal Traction Development and University of Reading, UK) and by Simon Ellis and John Hine of the Transport Research Laboratory (TRL), UK. Phil Fouracre of TRL assisted with the editing.

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The authors would like to stress that this present document should be considered an early draft that will be enhanced, prior to publication. In this respect, they would welcome feedback and ideas for improvements.

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Acronyms and abbreviations

AAMA	American Automobile Manufacturers Association
ATNESA	Animal Traction Network for Eastern and Southern Africa, Harare, Zimbabwe
CKD	Completely knocked down
CTA	Technical Centre for Agricultural and Rural Cooperation, Wageningen, The Netherlands
DFID	British Department for International Development (DFID), London, UK
eg	for example
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit GmbH, Germany
hr	hour
IFRTD	International Forum for Rural Transport and Development, London, UK
IHE	International Institute for Infrastructural, Hydraulic and Environmental Engineering. Delft, The Netherlands
ie	that is to say
ILO	International Labour Organisation, Geneva, Switzerland
IMT	Intermediate means of transport
INRETS	Institut National de Recherche sur les Transports et leur Securitie, France
IRAP	Integrated Rural Accessibility Planning
IRF	International Road Federation, Geneva, Switzerland.
ISBN	International Standard Book Number
IT	Intermediate Technology
ITDG	Intermediate Technology Development Group, UK
ITDP	Institute for Transportation and Development Policy, New York, USA
ITSL	Intermediate Technology Development Group Sri Lanka
kg	kilogram
km	kilometre
LET	Laboratoire d'Economie des Transports, France
LFRTD	Lanka Forum for Rural Transport Development, Colombo, Sri Lanka
NE	Northeast
NGO	Non-governmental organisation
NW	Northwest
p	page(s)
ROADSIP	Roads Sector Investment Programme, Zambia
RTTP	Rural Travel and Transport Program, World Bank, Washington DC, USA
SSA	Sub-Saharan Africa
SSATP	Sub-Saharan Africa Transport Policy Program, World Bank, Washington DC, USA
TPAZ	Transport and Public Association of Zambia
UK	United Kingdom (of Great Britain and Northern Ireland)
USA	United States of America
VOC	Vehicle Operating Costs

Summary

PART 1 Rural transport needs, options and conditions

Rural transport allows men, women and children access to water, fuel, food, health services, education, employment, marketing opportunities and social interactions. Access depends on infrastructure and affordable transport options, for people and goods. Improved accessibility is fundamental to poverty alleviation, economic growth and rural development. Access may be improved by greater mobility and/or improved proximity to services.

Many rural transport technologies exist. Land-based systems are addressed here, but rural water transport can be very important. Between walking and large motor vehicle is a range of local transport solutions, intermediate in scale and cost. Intermediate means of transport (IMTs) include handcarts, bicycles, animal transport, motorcycles and power tillers. Larger motorised transport, including pickups, trucks and buses, are expensive and complicated, but efficient for long distance transport with high utilisation of their capacities. The complementary nature of large-scale and small-scale transport is stressed: both are needed for efficient rural transport. Intermediate means are particularly important for on-farm, within-village and village-to-market transport. Trucks and buses depend on local 'feeder' transport for consolidation and dispersal of passengers and goods.

Rural transport requires appropriate infrastructure (paths, roads, bridges) that vary with construction standards, maintenance and environmental conditions. Some transport modes have high infrastructure requirements. Rural transport modes may be operated for personal use (family needs and enterprises) or as commercial transport services, involving the users paying charges. Many local transport solutions are used both for household purposes and informal hire. This paper addresses rural transport operations, whether services or private.

Governments and donors have concentrated on rural infrastructure, neglecting the availability and affordability of transport operations, whether large-scale transport services or small-scale local transport solutions. This paper argues for an integrated approach, recognising that infrastructure, large motorised services and small local transport are inextricably linked, with maximum economic efficiency and social benefits coming from their combined synergy.

Technical choices, diversity, complementarity and adoption patterns

The benefits of diverse transport technologies are examined. Each has unique combinations of cost, load, speed and convenience. Nationally and internationally, clusters of transport modes exist, associated with differences in population density, cultures, incomes, topography, climate and animals. Some adoption patterns seem paradoxical, depending not only on economic conditions, but also on human aspirations, ingenuity and chance combinations of circumstances. Preferred types of ox cart, tricycles and motor vehicle vary greatly.

Productive economies support many, varied transport devices. A high diversity of complementary transport modes develops in areas of high demand (eg, markets and depots). Long-distance trucks and buses are served by various simpler technologies, including handcarts, transport animals, and cycle- and motorcycle-based devices. Year-round economic activity allows a 'critical mass' of mutually dependant transport users, operators, suppliers and support services. In remote rural areas, low economic activity, high seasonality and lack of supplies and supporting services make it difficult to own transport technologies for private use or public service. Improving rural infrastructure removes some constraints, other limiting factors need addressing to assist a 'critical mass' of transport users and service providers.

The organisation of rural transport services

Many different stakeholders influence the provision, price, quantity and quality of rural transport operations. These include users, various public and private institutional stakeholders (several national ministries, local government, transport agencies, funding institutions, training organisations). They also include the transport service suppliers (freight and passenger, large

and small, formal and informal) as well as support services (manufacturers, importers, retailers, workshops, artisans, etc), transport infrastructure contractors (large and small), professional associations and non-governmental organisations. Users differ according to income, occupation, age, gender, ethnic background and socio-cultural characteristics that influence preferences and needs. A five-category income-based classification is presented.

National or local governments regulate motorised transport through licensing, inspecting, route allocation and fare structures. Parastatal companies (which may self-regulate) are generally on the decline and small entrepreneurs and companies operate most long-distance transport, with little coordinated route planning. Transport operators form associations for self-regulation, determining prices and minimising competition. Most intermediate means of transport, for private use or hire, operate in rural areas in the informal economy without regulation. Transport users seldom form associations, and their voices are little heard.

PART 2 Implications and ways to address rural mobility

Economic efficiency and profitability

The ownership of transport devices and use of transport services depends on economic profitably. People aspire for mobility and low drudgery, but they cannot afford these without income. Most transport devices generate income, save time or assist profitable ventures. The adoption of intermediate means of transport is strongly influenced by opportunities for profitable employment, marketing or hire.

Forecast changes in agricultural production resulting from roads have been over-optimistic. Changes in the transport costs of agricultural inputs (which are few) have little impact, while the transport cost of marketing depends on many other factors besides roads. It is affected by lack of vehicles and by lack of competition.

Motorised transport is expensive in Sub-Saharan Africa, compared with other regions. This is due to low density of demand, low utilisation rates (due to monopolistic cartels), poor vehicle operation and maintenance, poor driver training and high cost of fuel, vehicles and components (due to low competition). Within Africa, short rural journeys are relatively expensive due to low vehicle utilisation, low competition, poorer roads and smaller vehicles (large vehicles travel long distances on better roads). Rural Africa has few vehicles available for transport. The value of time lost through poor transport is underestimated.

User perspectives and gender

Transport programmes must understand the diverse perspectives of the different users. Participatory techniques (eg, focus groups) can predict the transport needs, preferences, priorities and purchasing power of women and men, children and old people. Irrespective of economic logic, transport adoption and use is influenced by social status, prestige and aesthetics. Attitudes evolve and projects must understand changing perspectives. People prefer safe, comfortable transport, but accept low standards. Transporters often maximise income by loading to physical limits and avoiding spending on maintenance and safety.

Most transport is owned and operated by men. Due to inequalities in gender relationships: women often do not have the same access to the money, credit or income to buy or use transport. Despite women's transport needs and under-representation among transport users, women may be 'invisible' to transport programmes. Transport planning focused on roads and the long distance services, neglects local transport solutions of particular importance to women. With cultural acceptance, rural women can benefit from bicycles and donkeys.

Transport operating environment

Infrastructure is crucial, with bridges being particularly important. Greater benefits come from upgrading paths to tracks, than improving existing road surfaces. Increasing the inter-connectivity of routes, avoiding 'dead ends', improves rural transport. Spot improvement for maintenance is a cost-effective strategy. Although high standard roads are desirable, they are expensive. Many interconnected low-cost roads can be better than a few higher quality roads.

Infrastructure should be designed for all vehicles, including intermediate means of transport. Separate lanes are appropriate in busy locations. Motorists favour prohibiting intermediate means of transport, but this is economically damaging and disadvantages many people.

For motorised services, rural regulation is often minimal. Quality regulation can depress transport frequency and increase prices. The cartel practice of delaying departure until a vehicle is full reduces service frequency and reduces inter-town pickups of passengers/freight.

Rural markets and transport services can be mutually stimulating. Farmers' markets can help bypass trading cartels and increase farmers' income. Rural and urban transport are inextricably linked. Many motorised rural services are run from towns and services can be affected by urban terminal controls. Poor availability of intermediate means of transport in rural areas restricts adoption. Limiting factors to address include inadequacies in capital/credit availability and supplies of carts, axles, bicycles, materials, components or donkeys. Training and management support to rural enterprises is also important.

Promotion of rural transport technologies

The 'pump priming' promotion of appropriate transport technologies, such as cycles and transport animals, can help to alleviate rural poverty and increase production, trade and economic activity and subsequent transport demand. With innovative technologies, it is best to start with areas/conditions where adoption is most likely, and a critical mass can be established. Credit or subsidies (for users, traders, manufacturers or importers) can stimulate transport adoption, but may distort choices. Credit programmes should consider the specific needs of women. Direct or indirect rural transport subsidies may be justified if provision is below agreed standards. Route subsidies are only applicable if there is a competitive market.

Self-critical monitoring and objective evaluation are vital for transport programmes. Faster progress can be achieved by stakeholder-involvement at all stages. Lessons should be widely shared to accelerate overall progress. This requires active networking at national, regional and international levels. Broadly based national and international networks should encourage information exchange and collaboration. They should promote greater understanding at all levels of the many factors that influence the development of efficient rural transport systems.

PART 3 Conclusions and recommendations

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, an appropriate policy and regulatory environment and cultural and gender influences on transport demand. To improve rural transport services requires the assessment of these factors with stakeholder representatives to identify and address key limiting factors.

Although differences exist between countries and regions, important transport lessons emerge from comparing demand and supply patterns. Two contrasting situations are presented. The 'low density' scenario exists in much of rural sub-Saharan Africa, remoter areas of Latin America and Asia and mountainous areas of the world. These have low population densities, few motorised vehicles and few intermediate means of transport. They are agricultural areas with traditional crops and/or animals, little paid employment and undeveloped marketing systems. They have poor, transport infrastructure and low transport diversity. Passenger and freight services are often combined, but infrequent, expensive, overcrowded and have poor safety. Motor transport is barely viable, due to high costs and low economic demand. There is little transport competition. Processes of innovation and adoption are slow, with low economic activity, low availability of materials, limited information exchange and high seasonality of cash flows and transport demand. There is no 'critical mass' of transport services. A vicious circle of insufficient transport, users and services hinders development.

The 'low density' scenario is contrasted with a 'high density' situation, noting the continuum of intermediate conditions. 'High-density' situations are found in all regions, and are most

obvious around rural markets and in peri-urban areas. The high density of transport demand is associated with medium to high populations, irrigated agriculture (reducing seasonality), 'cash crops', efficient marketing systems and non-agricultural employment. Transport infrastructure is adequate, services have achieved a 'critical mass' making it easy to buy and maintain motorised and non-motorised transport devices. Innovation and adoption are rapid, with high economic activity, availability of materials and rapid information exchange. There is a high diversity of transport. Transport is widely available, but there problems with overloading, with poor safety, anarchic services, and little regulation or enforcement. Intermediate means of transport are not considered in planning or infrastructure, and with road congestion, users of four-wheel (and above) motorised vehicles become frustrated by smaller vehicles (human, animal, motorcycle) and endeavour to have them prohibited.

Possible interventions

In these contrasting scenarios (and intermediate situations) intervention options are available to improve the efficiency, effectiveness and equitability of rural transport. Some are widely appropriate, while others are geared to 'low-density' or 'high density' situations. In all situations, key stakeholders should be included in participatory processes in policymaking, planning and implementation. General interventions include developing appropriate infrastructure (roads, paths, bridges), high economic demand, market access, profitable production and marketing, critical mass, assured supplies, fair competition and access to credit, training and information.

Participative planning processes and empowerment

In all situations, participative techniques involving all stakeholders should be used to define transport needs, priorities and purchasing power of rural people. Cross-sectoral, holistic planning is needed to address infrastructure and mobility within an integrated solution. An equitable strategy should incorporate gender analysis and consider disadvantaged groups. Transport planners require broadly-based training. Transport programmes should undertake self-critical monitoring and objective evaluation, including poverty-reduction criteria.

Develop policy and create awareness

Politicians and the transport professionals must be made aware of the need for motorised transport services and intermediate means of transport to complement infrastructure. An enabling environment should stimulate a wide range of complementary transport technologies. Local transport solutions should be encouraged. Positive images should be presented through education and the media of the present and future value of cycle-based technologies and animal power. People should be made aware of gender imbalances in transport. Participative research should be undertaken on technical, economic and social aspects of transport technologies and services and the problems of stakeholders. Information should be shared through active networking at national, regional and international levels.

Encourage the diversity of vehicles and transport technologies

Efficient rural transport systems need a diversity of vehicle types, with long-distance motorised vehicles and local transport solutions for within-village and village-to-market transport. A range of intermediate means of transport options should be promoted, with strategies designed to achieve a 'critical mass' of users, suppliers and support services. Direct or indirect subsidies may be considered, but the provision of credit (to purchasers, suppliers, artisans, etc) may be particularly helpful in stimulating adoption and use. The specific needs of women for transport technologies, services and credit should be considered.

Improve economic conditions and cash flows and stimulate local initiatives

Transport, economic activity and marketing opportunities are closely linked and mutually stimulating. Improving rural markets, employment through labour-based roads and transport hire opportunities can assist the adoption of local transport solutions and transport services. People can be supported to set up transport service operations through provision of credit and training in operation, maintenance and enterprise management.

Promote regulatory reform, increasing competition and demand management
Restrictive, monopolistic practices by transport associations should be discouraged through education, incentives and/or legislation. Increasing competition should be encouraged. The efficiency of rural services can be assisted by the interconnectivity of infrastructure, the provision of rural markets and the promotion of 'feeder' intermediate means of transport. Demand management can be improved through transport brokers and improved flow of information, including market prices.

Enhance human capacity
Training should be provided to assist enterprise management, drivers, maintenance and support services, rural workshops and the welfare of transport animals.

Improve inputs and supplies
The relative costs and benefits of international (low cost) supplies (vehicles, bicycles, components) and local manufacture should be assessed. In 'low density' rural areas, improving the local supplies of carts, cart axles, bicycles, etc can assist adoption. Limiting factors may be components, materials, skills, facilities and/or credit. Improved supplies of spares may come from improved training, manufacture, sourcing, depots and distribution.

Improve infrastructure and traffic management
Bridges and structures are key components of rural infrastructure. Spot improvement techniques for roads and the upgrading of paths and tracks are generally cost effective. Good terminals can improve rural transport services. Infrastructure should be designed for all users, including non-motorised traffic, with special lanes if necessary.

Consider targeted subsidies
Subsidies may be justified if rural communities fall below agreed minimum access and mobility standards for both motorised transport services and local transport solutions. Direct subsidies through competitive tender may work on uneconomic service routes. Indirect subsidies through prices can increase transport, but distort choices if linked to specific technologies. Fiscal subsidies may marginalise the informal sector.

Improve safety and promote a good environment
Driver training should increase transport profitability and safety. Vehicle standards and inspections are required to improve roadworthiness, including brakes, lights and safe vehicle loads. Safety is often low in rural areas, but excessive regulation and enforcement could reduce the availability and affordability of transport. The same applies to stricter environmental standards. In 'high density situations', increased value should be given to non-polluting options, including cycle technologies and animal-transport.

Choice of interventions and methodologies
In low-density, 'unfavourable' situations it may be necessary to intervene to break the vicious circle of low adoption and unaffordable services. Strategies to stimulate new transport initiatives may well include some active promotional interventions (eg, credit, subsidies, improved supplies) and/or initiatives to stimulate the rural economy through higher production, marketing and employment. Although regulation may be desirable, a relatively light approach is required, to allow transport capacity and utilisation to expand.

In the 'high density' situations, there is less need to stimulate and develop transport operations and services. Given the more favourable conditions, development strategies are likely to facilitate and improve existing systems, with more emphasis on regulation, safety and the promotion of fair competition. In all cases, the choice of intervention will depend on local circumstances, and the priorities of the users and other stakeholders.

Please note that the introductory diagram (Figure 1).
'Rural transport operations:
complementary technologies working together'
has been omitted from this version of the paper

Box 1 What are rural transport systems?

All communities require **access** to supplies, services, facilities and opportunities. Basic needs include water, fuel/power, food, health services, education and employment. People need access to markets and may wish to participate in civic, religious and/or leisure activities. **Accessibility** to such things can be measured in terms of time, effort and cost. Access depends on infrastructure (availability of water sources, roads and bridges, schools, hospitals, markets, etc) and available and affordable transport options, for people themselves and for their loads. Poor rural people often have to spend much time and effort to access basic necessities, and the reduction of isolation and inaccessibility are fundamental to poverty alleviation. Accessibility depends on **mobility** (ease and frequency of movement) and **proximity** (distance). Access may be improved by greater mobility and/or improved proximity to services (piped water, local health centres).

The most basic transport involves people walking between locations and carrying things themselves. Walking and carrying are simple, cheap and efficient technologies for short distances, difficult terrain and for small loads. At the other end of the spectrum are large-scale transportation devices, including lorries, buses, motorcars, trains, aeroplanes and ships. These are generally designed for moving people and goods quickly over long distances with large loads. These technologies are intrinsically complicated and expensive. Nevertheless, economies of scale can make the cost per tonne-kilometre or per person-kilometre carried quite low, provided operations are efficient and there is high utilisation of capacity. They have advantages for long distance transport.

Between these extremes, there is a wide variety of **local transport solutions** that are intermediate in scale and may involve a variety of different forms of technology, these are often referred to as **intermediate means of transport** (**IMTs)**. These increase local transport capacity and reduce drudgery at relatively low cost. They are most commonly used for relatively short distances, from 100 metres to 20 kilometres. Some are non-motorised transport systems (eg, handcarts, bicycles, animal-powered transport) while others have small motors (eg, motorcycles and power tiller trailers). Equivalent intermediate water based transport technologies include canoes, rafts and small boats.

Rural transport depends on appropriate **infrastructure** (paths, roads, waterways, bridges, railway tracks and their associated maintenance and traffic management systems). The infrastructure includes paths, trails, tracks, access or feeder roads, secondary roads and primary trunk roads. These may all vary in quality, depending on the weather, season, construction and maintenance, and some transport technologies require certain infrastructure standards to operate effectively.

Operating on the transport infrastructure, are a variety **transport modes**, carrying passengers and/or freight. These include, trucks, pickups, buses, mini-buses, cars, 'bush taxis', animal-transport, motorcycles, tricycles, bicycles and handcarts. These may be for **private** or **commercial use**. Commercial **transport services** involve the users paying **fares** or **hire charges.** There is a continuum of arrangements between commercial hire and private use with many local transport solutions being used for both family purposes and informal hire. Rural transport, the focus of this paper, involves **transport operations,** whether primarily **transport services** or **private transport**.

Transport infrastructure and **transport operations** form **rural transport systems. Mobility**, for men, women, children and goods, depends on the availability, affordability and efficiency of such transport systems. Although mobility is not always productive, improved transport systems can increase accessibility, reduce poverty and isolation, and enhance social and economic development.

PART 1
Rural transport needs, options and conditions

Introduction

The importance of mobility in rural development and poverty reduction

Despite investment in roads, inadequate rural transport services and poor accessibility constrain economic and social rural development. The local roads, tracks, footpaths and bridges used for access to farms, markets, water supplies, schools and clinics are often in poor condition for some, or all of, the year. Motorised transport services for goods and/or people in rural areas are often infrequent and inadequate, and may be unaffordable by many rural people. In rural areas, traffic is often low on the major roads that link rural areas to services and allow the export of produce to markets and urban populations. In some parts of the world (notably sub-Saharan Africa) most village transport still involves people (mainly women) walking and head loading.

Alleviating rural poverty requires better mobility, which requires a combination of appropriate transport infrastructure, improved transport services and affordable transport technologies. At one extreme is large-scale motorised transport, including motorcars, large trucks and buses and trains. At the other extreme there is walking and carrying. Between these extremes are the many intermediate technologies that can increase transport capacity and reduce human drudgery without the high costs associated with large motor vehicles. Local transport solutions (intermediate means of transport between motorised transport services and walking/carrying) include handcarts, bicycles and tricycles, motorcycles, animal-powered transport and low-cost boats. These may solve some problems of short-distance transport by increasing local transport capacity and reduce drudgery at relatively low cost. However such devices may not be available or affordable in rural areas.

The nature of rural transport

Village level transport, internal to the local area of the village, includes the collection of water and firewood, trips to fields for crop and animal husbandry and marketing inside the village. These transport tasks are predominantly carried out on an informal network of paths and tracks. The main technologies are carrying (eg, headloading), pack animals and carts.

Studies in Burkino Faso, Ghana, Tanzania, Uganda and Zambia suggested that up to 80% of the total village based transport burden, in terms of tonne kilometres, comprised very short distance trips within the village area (Dawson and Barwell, 1993; Barwell, 1996). In Africa, women tend to bear the main transport burden.

External travel (travel outside the village) includes trips to and from farms and socio-economic transport for the purposes of marketing, employment, schools, health facilities, grinding mills and visiting friends and relatives. These involve longer distances, and are more likely to involve intermediate means of transport or motorised transport services. However, in many rural areas, even long distance movements may involve walking and carrying.

Journey purpose, trip frequency and mode of transport for external travel vary widely between and within districts and countries. Studies in southern Ghana, suggested that travel to market was the most common purpose of external travel, with most trips involving motorised vehicles. There was also considerable use of motorised vehicles for social and health visits. These villages had agricultural economies, with some crop sales and some other employment opportunities. Surveys in the less affluent northern areas showed similar pictures of trip purposes but much less use of motorised transport, which was mainly used for transport of harvest and occasional visits to health facilities and relatives (DFID, 1998). In the more

remote regions of Africa, Asia and Latin America, many families make little, if any, use of motorised transport services.

Affordability

A major constraint to the increased availability of rural transport services is rural poverty. Low incomes severely reduce the effective demand for services because fares for passenger and goods are greater than most rural people can afford. Studies in rural Zambia, showed that most household income was spent on food (over 65%). Transport was the fourth largest expenditure category, with poorer people spending less. The bus fare for one typical 24 km rural journey was equivalent to 6-8 weeks of total household transport expenditure. In such situations, few households would make use of bus services more than twice a year. Some would not use any external transport services at all. The main users of rural transport services are those from richer households or those engaged in external employment.

While the cost of transport can be a major constraint to the greater use of transport services, the lack of economic transport demand is itself a constraint to the development of cheaper, more efficient services. For rural transport services to improve, this 'vicious circle' has to be broken.

The need to address mobility and not just continue to build and upgrade roads

Government ministries concerned with transport and regional development, with the support of donor agencies, have concentrated on transport infrastructure, including roads, railways, ports and airports. Since 1985, about 15-20% of World Bank loans have been for investment in transport. Of the US$ 40 billion provided in loans/credits for transport, US$ 2.5 billion (about 6%) has been specifically for rural transport (World Bank, 1999; Bamberger and Lebo, 1999). However nearly all this money has been for infrastructure. Transport planners have paid little attention to rural transport services in general, and intermediate means of transport, in particular. The bias towards infrastructure still exists in national governments and donor agencies, and is reflected in terms of budgets, personnel and professional training.

In the 1960s and 1970s national governments and donor agencies put emphasis on expanding road networks with little regard to the problems of either sustainability or the need to develop transport operations on the new facility. However, it became increasingly obvious that inadequate rural transport and poor accessibility remained serious constraints to rural life and development. A number of influential village-based transport studies in sub-Saharan Africa highlighted the magnitude of human-powered transport (Howe and Zille, 1988; Airey and Barwell, 1991; Dawson and Barwell, 1993). Rural people, particularly women, often walked long distances each day carrying heavy loads, such as water, firewood, grains, agricultural produce and goods for marketing. It became clear that large-scale investment in infrastructure was having very little impact on family and village-level transportation problems.

By the 1980s, there was seen to be a need for alternative approaches to transport. Several north-based organisations had been stressing the importance of intermediate means of transport, with early emphasis on developing new prototypes. The International Labour Organisation (ILO) concentrated on the potential for sustainable road construction and maintenance using labour-based methods and local transport solutions (Barwell and Hathway, 1986). The World Bank, in association with a number of European development agencies, established the Rural Travel and Transport Progam (RTTP) within the Sub-Saharan Africa Transport Policy Program (SSATP). This was intended to assist countries develop more appropriate transport policies. In a complementary multi-donor initiative, the International Forum for Rural Transport and Development (IFRTD) was established to promote transport policies more orientated to the needs of rural people. Despite these initiatives, transport ministries and supporting donor agencies have continued to concentrate transport resources on major infrastructure projects.

Poverty reduction objectives

Within many donor agencies, including the World Bank, poverty reduction became a clear mission statement. Concerned organisations published a series of transport papers that addressed some of the social, economic and technical problems of transport for the rural poor (Riverson and Carapetis, 1991; Malmberg Calvo, 1992, 1994a, 1994b; Dawson and Barwell, 1993; Connerley and Schroeder, 1996; Howe, 1997; Edmonds, 1998; Ellis and Hine, 1998; Starkey, 2000). These stressed both the need to develop transport services and the importance of local transport solutions for alleviating poverty by reducing isolation and drudgery. The papers concluded, in various ways, that the development of different transport operations and services should be an important element of national transport strategies. It was widely acknowledged that while governments should create favourable policies and operating environments, there would be important roles for the private sector and non-governmental organisations in implementing new initiatives.

Recent attempts to develop rural transport policies, strategies and interventions in Africa, Asia, the Americas and Europe have led to a variety of experiences. In some situations services and technologies seem to have taken off spontaneously without government assistance. In others, adoption only occurred after specific promotional campaigns. In some countries, potential users rejected particular technologies, despite subsidies, credit provision and active promotion. The diverse experiences illustrate the importance of the appropriateness of transport technologies to local needs and operating environments. More significantly, they highlight lessons relating to user-perspectives and the overriding importance of social, economic and cultural issues.

Scope of this paper

This paper will address and analyse the factors that have influenced the success or failure of particular rural transport strategies and initiatives. Rural transport operations include both motorised and non-motorised transport technologies operating within or outside villages, and encompass all modes of transport (from walking and carrying to bus services and freight haulage by truck).

Although rural transport is the focus of this report, it cannot be taken in isolation from other transport systems. Rural transport technologies often depend on urban centres for their supply and maintenance. Whether directly, or indirectly, urban centres may be the origins and destinations of rural trips. The structure of urban and inter-urban bus services, as well as long distance freight movements, all impact on the structure of rural transport services. Transport services operating in rural areas, may be owned by urban based people. Most of the institutions that influence and govern the operation of rural transport services are urban-based. Although urban and rural situations are very different, many of the lessons learned from transport initiatives in one context may be relevant in other areas.

Technical choices, diversity and complementarity

Transport options

The range and diversity of transport technologies currently in use in the world is remarkable. The many options available have different ranges, capacities and operating costs. These overlap and provide a continuum of complementary transport options, each with advantages and disadvantages. They vary in purchase price, payload, complexity and their requirements for infrastructure, energy sources (human, animal, electricity, petroleum), foreign exchange and supporting services (mechanical, artisanal, veterinary, financial, informatics and traditional skills). Some of the options and different requirements are summarised in Table 1. Certain key features of the different technologies are mentioned in the following sections.

Table 1 Means of transport with indicative characteristics and important requirements*

Transport type	*Indicative characteristics*					*Some important requirements*			
	*Indicative cost price * ($ relative)*	*Indicative load * (kg)*	*Indicative speed * (km/hr)*	*Indicative range * (km)*	*Indicative cost/tonne/km* ($ relative)*	*Foreign exchange*	*Animals and vet services*	*Mech-anics*	*Good roads or tracks*
Carrying/head load	0	20	5	10	1.50	Low	None	Low	Low
Sledge	10	100	4	3	0.80	Low	High	Low	Low
Wheelbarrow	30	100	4	1	0.40	Low	None	Low	Low
Hand cart	60	150	4	5	0.35	Low	None	Low	Medium
Pack donkey	60	80	7	20	0.70	Low	High	Low	Low
Bicycle	100	60	10	20	0.60	Medium	None	Medium	Medium
Cycle rickshaw	170	150	8	15	0.45	Medium	None	Medium	High
Donkey cart	300	400	6	15	0.60	Medium	High	Medium	Medium
Horse cart	500	1000	7	15	0.60	Medium	High	Medium	Medium
Ox cart	500	1000	5	10	0.20	Medium	High	Medium	Medium
Motorcycle	900	100	50	50	1.30	High	None	High	Medium
Power tiller trailer	5000	1000	10	15	0.70	High	None	High	Medium
Pickup	12000	1200	80	200	0.70	High	None	High	High
Truck	60000	12000	80	200	0.50	High	None	High	High

* *Notes: This is based on a table provided in Starkey (2000), which provides order-of-magnitude indicative figures only. The costs, prices, loads, speeds and distances vary greatly with the country, the people, the environment, the infrastructure and the vehicles or animals. It is not uncommon for the transport systems mentioned to carry much greater loads and to travel much longer distances. The figures are simply indications of what is commonly achieved. The costs per tonne-kilometre are very approximate, and highly sensitive to assumptions on costs, loads and distances: they are mainly based on the model of Crossley and Ellis (1999) for 5 km journeys.*

Carrying, wheelbarrows, hand carts and trolleys

Although humans can carry loads of 50 kg for short distances, loads of 10-20 kg are more normal. The comfort of carrying these can be increased with simple technologies such as poles, shoulder yokes or backpacks. Such devices, and also balanced headloads, allow one or more hands to be free to assist balance (or support a child). Carrying has the major advantages of being very flexible and requiring little infrastructure. It is the technology of choice (or necessity), for small loads and small distances, in 'difficult' environmental conditions (eg, mud, slopes, streams, dense vegetation).

The amount a person can comfortably carry can be increased greatly using simple wheeled devices, such as wheelbarrows, hand carts and trolleys. Depending on the environment (ground surface and slope), these can comfortably carry 50-100 kg. Balanced hand carts (with most load on the wheels) are more comfortable than wheelbarrows with one forward wheel. However, the wheelbarrow can operate on smaller paths. Carts, barrows and trolleys generally require two hands to operate them, but they are easy to park, and are well suited to intermittent journeys (itinerant selling, collecting or delivering). They are generally used for short distances (100-2000 metres).

Bicycles and tricycles

Bicycles are one of the most available, affordable and flexible means of transporting small loads over short distances. Bicycles are used worldwide for personal transport, in rural and urban areas. In some countries they also have important functions for carrying other people (family, friends, hire) and small loads (up to 100 kg). They do not need elaborate infrastructure, but are most appropriate in relatively flat areas, with hard surfaces (they are difficult to use on muddy or sandy paths). They are mainly used for distances of 1-10 km, although longer journeys are possible. Like many wheeled technologies, bicycles benefit from a 'critical mass' of users to justify support services and make adoption and use easy. Bicycle numbers are increasing in most rural areas. Bicycles may be fitted with simple load-carrying devices, including additional seats (for children or adults). In order to carry large loads, bicycles may be pushed, rather than ridden. In Vietnam, bicycles fitted with folding side platforms and rods to balance the handlebars and saddle can carry extraordinary volumes and loads.

Cycle trailers can increase the weight and volume that can be safely carried by a bicycle. Trailers are detachable, allowing the bicycle to be used for personal transport as well as carrying loads. Although examples of cycle trailers can be seen in many countries (including Cambodia and Denmark), they are seldom common. In some countries, including Cuba, bicycle 'sidecars' are used to transport people or goods.

Tricycles also increase the weight and volume that can be safely transported. They may have two wheels at the front (eg, Peru) or behind (the cycle rickshaws of the Indian subcontinent). Although tricycles are mainly used in urban areas (high transport demand, good roads, support services), they may be used in rural areas for carrying people or goods. Tricycles have achieved 'critical mass' in several Asian and Latin American countries, but they have yet to be widely used in Africa.

Animal power

Many different animals can be used for riding, as pack animals and/or for pulling sledges, carts and wagons Different species have their particular advantages and disadvantages. They include oxen (available and strong, but slow and expensive), cows (multipurpose) and buffaloes (strong but sensitive to heat). Horses (fast and strong but delicate), mules and donkeys (small but cheap) are faster transport animals, although mainly in temperate, sub-

tropical and highland areas. Camels, llamas, elephants and dogs have more specialised transport niches. Animals can be used singly or in teams, providing a wide range of transport capacities, from 50 kg (single small pack animal) to 5000 kg (wagon pulled by two or more oxen, horses or mules). Animals are most commonly used for trips of 1-10 km, but longer journeys are possible.

Animal transport often very appropriate and affordable in rural areas, where feed resources are available, and the animals have multiple functions. Animal-drawn carts can carry significant loads between fields, farms and villages even if tracks are poor. Animal-drawn carts may be expensive relative to rural incomes, but maintenance is relatively simple and affordable. While carts are mainly used in flat areas, pack animals provide important mobility in hilly areas.

Animal transport is common and/or increasing in many parts of the world. Animals are generally privately owned and provide transport services for the family as well as for hire.

Motorcycles and three-wheelers

Motorcycles (including mopeds and scooters) are mainly used for rapid personal transport, but they may also be use to carry passengers and small amounts of freight. Although relatively expensive to buy and run, they have the benefits of convenience, speed and flexibility. Their use is increasing in most developing countries. In many countries in the world, motorcycle drivers provide rapid transport for their clients and small loads in both urban and rural areas.

The transport capacity of motorcycles can be increased by the use of a sidecar or a trailer. They can also be adapted to make three-wheelers, for carrying passengers and/or goods. In The Philippines, motorcycle sidecars are commonly used to carry six (or more) people. In Cambodia, motorcycle trailers may carry more than ten people, or over 500 kg, without major modification (or safety devices). In much of Asia, three wheelers based on motorcycle technology, provide urban and rural transport services. These have basic covers to protect passengers and goods from the weather. Although motorcycles can be used on poor tracks, motorcycle trailers and three-wheelers require good roads, without steep slopes.

Tractors, power tillers and utility vehicles

Tractors have important transport functions, whether in agriculture, road maintenance or forestry. Tractor can pull trailers with loads in excess of five tonnes on very poor tracks. Nowadays, four-wheel tractors are quite complicated machines, specialised for traction in poor terrain. They are expensive, but may benefit from preferential agricultural rates of duty. They are mainly used for relatively short distances (1-5 km). Although they are relatively inefficient for longer distances on roads, they are sometimes used in this way, due to the scarcity of other transport options.

Two-wheel tractors or power tillers are also agricultural implements with secondary transport functions. In South and Southeast Asia, trailers pulled by power tillers (iron oxen) are becoming increasing important for rural transport (1-10 km). Farmers can employ them profitably in irrigated rice systems, with additional uses for family transport and transport hire. They may also be used mainly as transport services, and this may, in part, be due to preferential taxes and duties on agricultural equipment. In flat areas, trailers can transport more than 20 people. Night time transport with power tillers is a recognised hazard in many countries. The use of power tillers has been tried in several countries in Africa and Latin America, but they are generally unsuitable for conventional, rain-fed cropping systems and there has been a problem of reaching a critical mass of economically viable units.

In Southeast Asia, local entrepreneurs have made basic farm and transport vehicles, equivalent to a pickup or small truck. These are known as itaen (Thailand), koyun (Cambodia) and congnong (Vietnam). The fact that they are locally known as ‘iron oxen’ (the name given to power tillers) may provide evidence of their evolutionary origins. They are made from a

scrap chassis onto which is mounted a small engine. The diesel engines originally came from power tillers, and could be moved between machines, but now they may be bought specifically to power the light truck. While the manufacture is basically artisanal (with no two vehicles identical) some small workshops make over 100 per year. Although these vehicles have few refinements (or safety features), they are very cheap. Transport entrepreneurs often operate them, carrying building materials, goods and people in rural and periurban areas. Such vehicles are not normally seen in other parts of the world.

Cars, pickups and minibuses

Pickup trucks with load capacity of one tonne and ability to carry a dozen passengers in comfort (and many more if necessary) are versatile vehicles widely used in rural transport. They are mainly used for medium to long-distance travel (10 – 200 km). Pickups used in rural transport services may be fitted with passenger-carrying benches and load-carrying roof racks. The size and speed of pickups, and their ability to cope with poor roads throughout the year, make them well suited to the long-distance transport needs of small and dispersed communities. Cars (bush taxis) and mini-buses fulfil similar niches in periurban and rural areas, but do not have the same ability to cope with very bad roads. Minibuses are becoming increasing common for transporting passengers and small loads in areas where roads are well maintained.

Large buses and trucks

Large trucks (5-30 tonnes) and buses (30-60 passengers) are most cost-effective when carrying full loads over large distances (20 – 200 km). They are not always as suitable for rural transport as smaller vehicles, because demand is dispersed making it difficult to attain a reasonable load factor. Trucks have a very seasonal demand in rural areas (with peaks around harvest time). Buses can be viable on peri-urban and the more densely populated rural routes, but they may be inappropriate for the lower bulk of dispersed rural communities. However, as rural production, affluence and transport demand increases, these larger vehicles can become important as the cheapest transport options for consolidated loads.

Figures 2 and 3 provide an indication of how some of the main vehicles described above compare with each other in cost terms for given distances and levels of demand. It is clear from these Figures that each vehicle has a cost advantage at some combination of distance and demand. For example at low distances and demand the bicycle is the most cost effective form of transport right up to the truck which takes over at the highest distances and levels of demand.

Figure 2:
Vehicle operating costs assuming a 10 km distance and varying levels of demand

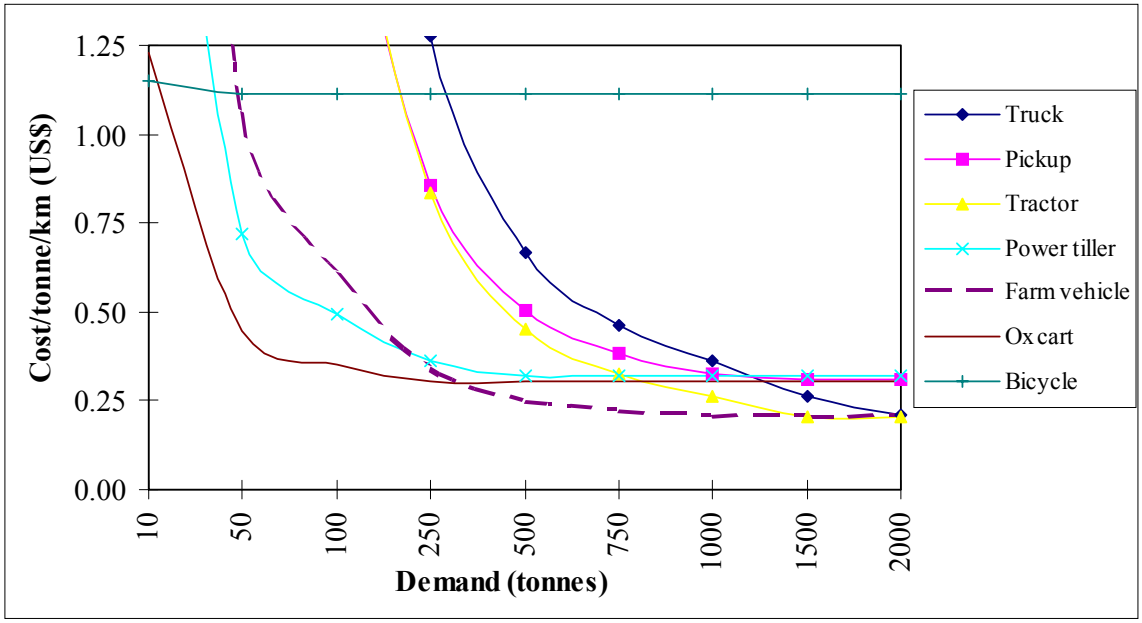
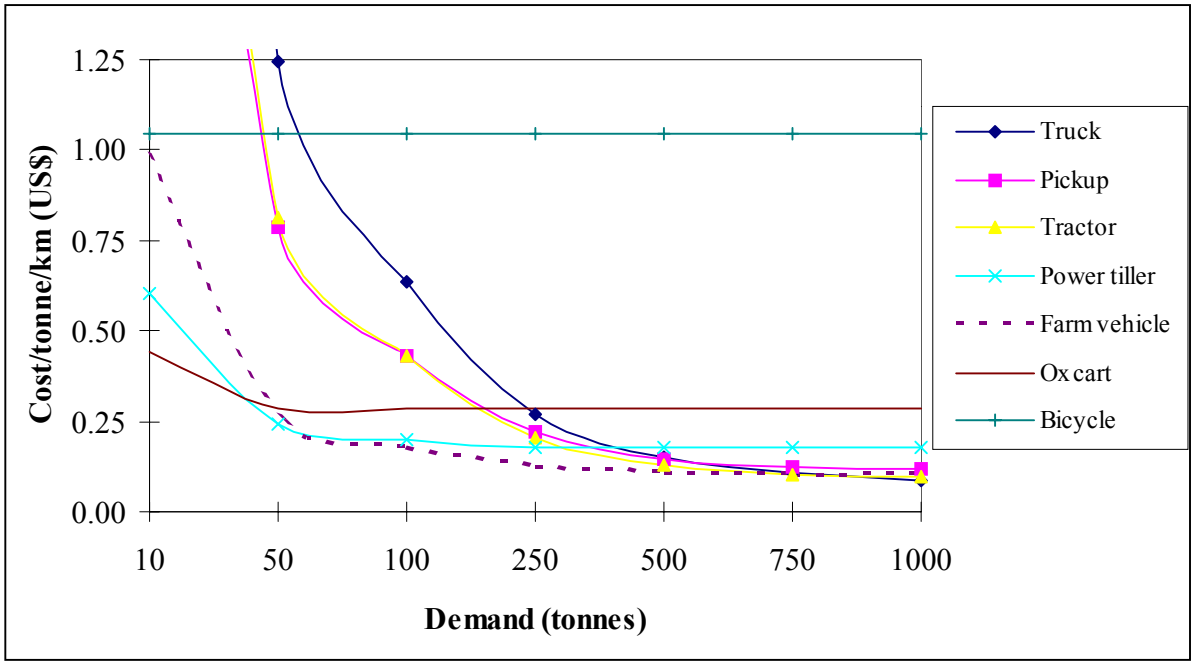


Figure 3: Vehicle operating costs assuming a 50 km distance and varying levels of demand



Complementarity

The large range of rural transport technologies (carts, cycles, animals, trucks, buses, etc) can coexist, fulfilling different specialised niches. Each offers a different combination of cost, weight, carrying capacity, manoeuvrability, speed, durability, infrastructure requirements and aesthetic characteristics. The various technologies should be considered complementary.

The complementary nature of rural transport technologies can be seen throughout the world. This is most clearly illustrated at places where long-distance and local transport systems meet, whether the long-distance transport involves trucks, buses, trains, boats or aeroplanes.

Passengers and goods arrive and leave on a wide variety of transport systems (porters, cycle-based, motorcycle, animal, cart, motor taxi, pickup, minibus, etc).

In Indonesia it is common to use three different modes to make a journey. Motorcycle taxis pick up people from villages and the outer suburbs of towns, within towns light passenger vehicles are common whilst for long distance movement, large buses tend to be used. In Indonesia motorcycles are able to negotiate narrow mountain paths and squeeze through narrow streets originally built for pedestrians. In Cambodia and Indonesia, motorcycle taxis commonly queue near bus parks and stops on the main road to take people to their final destinations.

For short distances and small loads, large-scale motorised transport can seldom be cost-effective. The first and/or the last links of transport systems and marketing chains invariably involve local collection and distribution. For this 'feeder' transport, local transport solutions (human, animal or motor) are likely to be appropriate, convenient and affordable.

The importance of complementary transport technologies is not always recognised. Some authorities have tried to discourage simple local transport solutions (eg, hand carts, animals, cycle rickshaws, motor tricycles). In some case it was due to perceived problems of congestion. In other cases, the 'intermediate' technologies were regarded as old-fashioned and inferior technologies. In all countries there will continue to be appropriate, complementary niches for transport technologies such as bicycles, riding animals, wheelbarrows, delivery carts, farm trailers, supermarket trolleys or executive scooters. Other special transport devices can assist the old, the young and the handicapped. It is therefore important that 'intermediate means of transport' are considered as important, complementary local transport solutions.

Diversity and competition

In general, where there is a high and diverse demand for transport (eg, around markets and depots), there is a high diversity of complementary transport technologies. The potential for an efficient diversity of complementary technologies, each offering particular combinations of cost, load, speed and convenience, can only be realised is a high density of economic transport demand.

If there is not a high transport demand, those transport services that do exist in an area may be only marginally viable. Any new technology that is introduced has to compete for the small transport market. An animal-drawn cart may take on the transport work of porters; a pickup may take hire loads from a cart. In this respect, technologies can be competitive as well as complementary.

Using a biological analogy, productive ecosystems can support many different plant and animal species. However, the 'species diversity' is much lower in infertile, unstable or unproductive ecosystems. Here competition for the limited natural resources favours a small number of adaptable species, rather than narrower niche specialisation. Similarly, in transport, in remote rural areas with low agricultural production, there may be a small number of multipurpose transport devices (animal carts and a few pickups and perhaps cycles). In the same country, around busy markets, there may be more than forty different types of cart, trolley, cycle, tricycle, motorcycle and motor vehicle, each with different technical, economic and aesthetic qualities.

The low diversity of transport technologies found in much of rural in Sub-Saharan Africa, is matched by similar lack of diversity in comparable rural situations in Asia (eg, Laos) and Latin America (eg, Bolivia). Reasons for this lack of diversity, and ways of stimulating greater complementarity will be discussed in subsequent sections. Among the things to consider are overall transport demand, availability of cash/credit, seasonality, critical mass, information flows, supplies and services, promotion and socio-cultural factors.

Paradoxes and conditions

International adoption patterns of transport technologies

The patterns of technology adoption are very varied and frequently paradoxical. Some technologies spread rapidly, others slowly and some innovations are never adopted. Some alternative technologies may coexist for years, while in other situations one rapidly replaces another.

In neighbouring villages in Vietnam, loads may be carried in baskets with shoulder straps, in baskets with forehead straps or on shoulder poles. In Chad, people in neighbouring villages may use three different water-loading systems: head loading, shoulder loading and back loading. In these cases, three transport technologies, with very different ergonomic profiles, have coexisted for centuries, preserved by the different cultural traditions.

The distribution of bicycles and tricycles varies greatly within countries and between countries. Cycle-rickshaw tricycles of various designs are common in (parts of) India, Bangladesh, The Philippines and Indonesia. They are not uniformly distributed within these countries, and are seldom seen in some other Asian countries such as Sri Lanka. There are four distinctive Cuban tricycle technologies, and they all differ from those operating in Peru and in Indochina, where passengers (or loads) are carried in front of the driver. Tricycles are rare in Africa, but bicycle taxis operate in parts of Uganda and Kenya. Nowhere in the world are cycle trailers common, but a 'traditional' design has become established in Cambodia.

Animal-drawn sledges are common in eastern and southern Africa and in Madagascar. Such sledges are seldom, if ever, seen in West Africa, but they are used in Cuba. India has 14 million ox carts, but few donkey carts. Ethiopia has millions of work oxen but very few carts. It has a population of five million donkeys that are used for pack transport. Donkey carts are common in parts of West Africa, but not in Madagascar or Latin America. Cows, rather than oxen, pull farm carts in Portugal and Romania. Horse-drawn carts and wagons are common in Eastern Europe, and parts Latin America.

Motorcycles with sidecars are a familiar sight in the Philippines, but not in other Asian countries. Motorcycles with trailers are widespread in Cambodia, but not in other Asian countries. Three-wheelers based on motorcycle technology, are widely used for transport services in most of South and Southeast Asia. Motorcycles, driven by men and women, are very common in Indochina. It is also quite common to see men and women driving mopeds (mobylettes) in Burkina Faso, Benin and Togo but this is uncommon in Guinea, Ethiopia and Tanzania.

Large numbers of power tillers are used to pull trailers in several countries in south Asia. Some power tillers are used for transport in countries such as Côte d'Ivoire, but this technology is yet to become common in Africa or Latin America. Locally-made 'iron-ox' vehicles are made in Indochina, but are not common elsewhere.

The larger motor vehicles used in rural transport services have certain similarities world-wide, due to the international nature of their manufacture and trade. However, there are clear patterns relating to types of vehicles being used and their local adaptations. In Indochina, forward control light trucks are modified for passenger use. In Guyana and South Africa, small minibuses are common, while in Kenya larger 'matatu' buses are popular. In Central America, much use is made of 'school bus' type vehicles, imported second-hand from USA. In the more remote rural areas, combined passenger-freight vehicles (pickups and trucks) are more common than buses. These are often adorned with local art and slogans.

National adoption patterns of transport technologies

Within any country, the adoption of a transport technology will not be homogenous and clear clusters of use can be seen. Some technologies (eg, bicycles, motorcycles and pickups) may be very widespread, but vary greatly in concentration. Others (perhaps water carrying bicycles

or donkey carts) appear clustered in one locality only. For example, in Ethiopia, donkey carts are seldom seen outside of the Rift Valley. In India, each state has one or more ox cart designs, typical of a particular area, but donkey and camel carts are much more localised. In Guinea, bicycles are seldom used in the southwest (containing the capital city and port) but they are quite common in the northeast of the country.

National clusters and differences may be correlated with differences in population density, different cultures, different incomes, changes in topography, climate, crops and animals. Thus motorcycles are associated with richer, higher density areas. Cycles are found mainly in flatter and medium-income areas. Donkeys are found in the drier zones and in hilly areas. Ox carts are generally seen in flatter areas away from forest zones. Hand pushed carts and wheelbarrows are most common in urban and peri-urban areas.

Some differences in transport technologies can be attributed to specific administrative areas. They may be ascribed to particular promotional initiatives (private operators, government-supported projects, NGOs) or differences in the local policy environment or infrastructure (eg, provision of cycle routes).

Some other aspects of the transport technology distribution appear more random. Areas with similar environmental and economic characteristics have different types of transport operations. For example, in Cuba, tricycle taxis operate in most provinces, but different regions have very different designs. In Havana, there are 'traditional' cycle rickshaws, looking like a conventional bicycle pulling a double passenger seat. In Pinar del Rio, the handlebars have been replaced by steering wheels. In Las Villas, the tricycle design is very different, with drivers peddling with their legs extended forwards. In Holguín, on the other hand, passengers are carried in a 'sidecar' attached to the cycle. These technologies may have each started with the initiative of one artisan or workshop. Other artisans in the surrounding area have since copied them. The technologies may have become almost 'traditional' in some localities, but have yet to spread to other areas.

Critical mass

The concept of 'critical mass' is crucial to the understanding of adoption and operation of transport technologies. For technical and social reasons, it is generally more difficult to operate a transport device if only small numbers are in use.

Transport technologies, large or small, 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. In a 'chicken and egg' situation: 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.

Starkey (2000) gave several examples from Madagascar, Guinea, Sierra Leone and elsewhere where there were problems developing a 'critical mass' of transport technologies in rural areas. In rural Madagascar, there was a critical mass for ox carts, with repair facilities in all villages, but not for bicycles, which had to be sent by ox cart to a rural town for repair. Attempts to demonstrate ox carts in widely dispersed West African villages failed due to the problem of punctures. This was summed up as 'ten carts in ten villages resulted in ten punctured carts, while ten carts in one village led to a village puncture repair workshop'. That caricature illustrated an important principle of technology promotion. There may be advantages in concentrating resources on a few villages/areas to achieve the critical mass for adoption, rather than having isolated demonstration examples. Nevertheless, it was noted that the isolated examples might increase the chance of adoption by random combinations of events (Starkey, 2000).

Once a transport technology has become established, the supporting services become widely available. In the case of cycle and motor technologies, areas develop in rural towns, where

there may be a number of workshops or street artisans offering to sell spares or undertaken repairs. In most towns in Africa, Asia and Latin America, on the approach roads and/or around markets and transport terminals, mechanics and traders compete to provide supply and repair services. Depending on the demand, village-based workshops may be established, with comparable, but smaller, concentrations of services around markets, terminals and roads. Once a critical mass has been established, operators of common transport devices have a wide choice of service providers for both purchases and repairs.

Cultural acceptance

Socio-cultural inhibitions may constrain the use of certain transport technologies, until there is a critical mass of users to make it acceptable. In the case of non-motorised, local transport solutions, it may be because the technology is not perceived as prestigious. Once the technology is well known, accepted and commonly used, it is easier for people to make use of it. In many parts of the world, it is difficult for rural women to ride bicycles, because of gendered perceptions. However, once a number of women start to use bicycles, the technology can become accepted. Thus in Cuba, Indochina and Burkina Faso, a 'critical mass' of women cyclists can be seen. However, this is not the case in (parts of) Guatemala, India and Guinea, where women cyclists are still unusual.

'Spontaneous' adoption

In most countries, the development of the critical mass of particular transport technologies has developed 'spontaneously', without formal promotion campaigns by public or private stakeholders. Examples include the widespread use ox carts in Asia, pack donkeys in Ethiopia, riding horses in Latin America, motorcycles in peri-urban environments and pickup trucks in rural areas worldwide. There are also numerous examples of technologies crossing political borders as they spread 'spontaneously'. They include tricycles from Peru to Bolivia, three wheel motorised 'tuk-tuks' from Thailand to Laos; donkey carts from Senegal to The Gambia, Guinea and Guinea Bissau; mopeds from Burkina Faso to Togo; 'school' buses from USA to Mexico and Central America.

For such spontaneous adoption, there clearly has to be a transport demand and a conducive environment. What cannot be known is how many other examples of spontaneous adoption might have also taken place had the environment for adoption been slightly more conducive. In many cases, a critical mass is not achieved and isolated initiatives fail to catch on. Even overall successful processes may hide numerous individual failures: an example of this is the adoption of donkey carts in new areas in Africa.

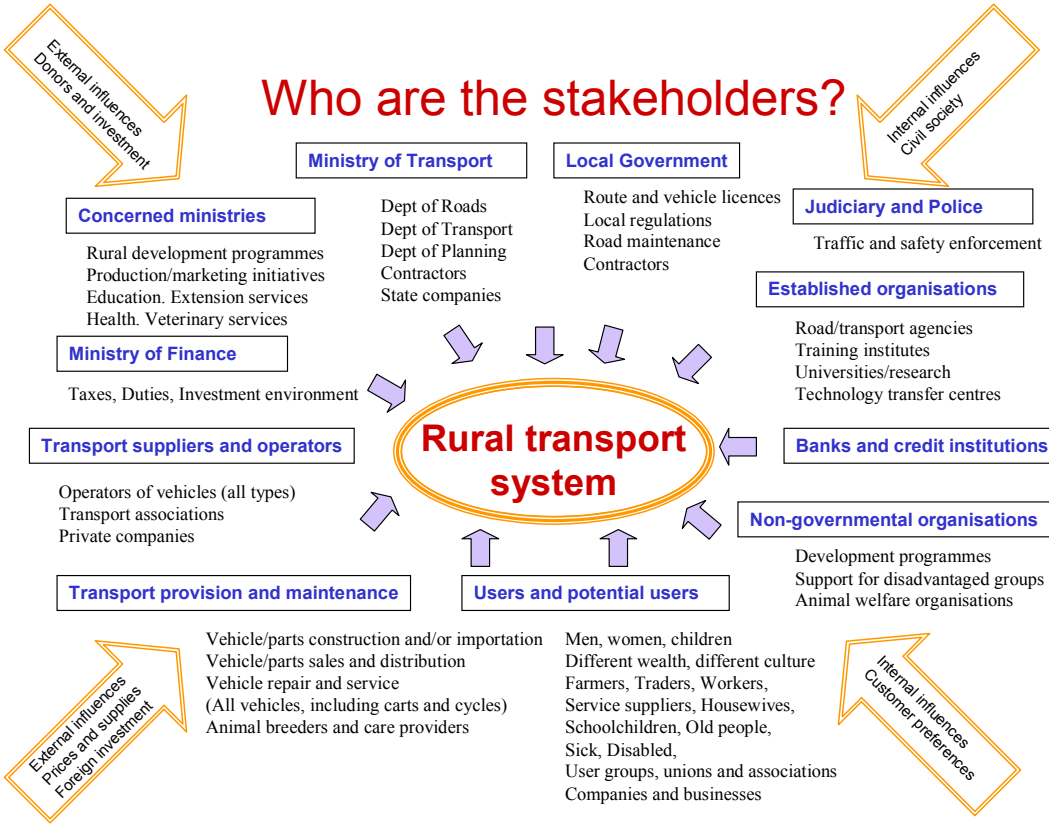
Loss of critical mass

The concept of critical mass also has implications for zones where particular technologies are declining. For example, there is declining use of wooden cartwheels in Mexico, Vietnam and Zanzibar and horse collars in Eastern Europe. If the demand for artisanal support services drops, the remaining users will have increasing difficulty in sustaining technologies. Many support services are family enterprises, with skills passed on from artisan to apprentice or from parent to child. Once such services have died out, it is difficult to re-establish them. If the declining technology is being replaced by affordable and accessible alternatives, then the change may be an inevitable social and technical evolution. However, if there are no affordable and accessible alternatives, action may be required to maintain viable populations of users and support services. Under apartheid South Africa, there was active discouragement of the use of donkeys in some areas. This was despite the lack of accessible alternative technologies for the poorer members of the communities. As the market contracted, there was a gradual decline in the established artisanal support services for cart production, leather harnesses, retail supplies and training (Starkey, 1995).

The organisation of rural transport services

The different stakeholders

The main players in rural transport operations are the operators, the users and the regulatory authorities. All contribute in some measure, both individually and in combination, to the performance of the transport sector. However, this is not the whole story and there are a whole host of other stakeholders who influence the provision, price, quantity and quality of rural transport operations. These include the major institutional stakeholders, in the public and private sectors (national government, local government, transport agencies, funding institutions, training organisations, etc). They also include the transport service suppliers (freight and passenger, large and small scale, formal and informal) as well as support services (manufacturers, importers, retailers, maintenance services, artisans, etc), transport infrastructure contractors (large and small), professional unions and associations, and relevant non-governmental organisations. Figure 4 gives an indication of the range of stakeholders involved.



Transport users

There is a wide range of transport users. They influence the types of transport provided and how it is organised but they can also be detrimentally affected by existing transport organisations particularly where they do not form effective user groups. Transport users can be considered in five income-based categories:

Group 1: The extremely poor. This category includes the most vulnerable, such as elderly and infirm, and often includes female-headed households and a high proportion of the most remotely located population. These people tend not to travel far, and if they do, it is only infrequently. Walking is by far the most important means of transport. Because of the very limited access to cash they make virtually no use of motorised transport. Regular motorised transport services can 20 km, or more, away from their homes. Sometimes long distance trips (over 40 km) will be made on foot and goods may be carried. Due to their extreme poverty, they will have less access to animals and intermediate means of transport compared with the

rest of the rural population. Their main contact with motorised vehicles is when a truck is employed in long distance movement to take away harvested crops from their village area.

Group 2: The very poor. These people will travel more frequently than those in Group 1. A greater use may be made of intermediate means of transport and animals than those in Group 1 but walking is still by far the most important means of transport. They will often walk regularly to market up to 10-15 km away and sometimes they will cycle many times this distance. The use of motor vehicles will be principally restricted to carrying harvested produce from the village area. Typically there will be no social use of motorised transport. Regular motorised transport services may still be located up to 5 km away while a functional road or track will usually be located within a kilometre. Sometimes, (possibly dangerous) long distance trips will be made on the top of, or in the back, of a truck.

Group 3. The poor. Travel by foot and by bicycle will be the most common methods of personal transport. There is likely to be increased ownership of, and access to, intermediate means of transport than in Groups 1 and 2. This group will tend to visit the local market on a regular basis and a key use of motorised transport will be the transport of harvested produce. Occasional and regular use of motorised transport will be made for longer distance (over 20 km) passenger movements. They are more likely to have access to surplus cash with which to pay for motorised transport if they have something to trade at market. They will also use motor transport to go to hospital and for occasional social visits. Transport services may be 1 to 5 km away. Buses, minibuses, trucks and trains are used for long distance transport.

Group 4. The better off. Will make frequent use of motor transport on regular basis. They will receive regular/ semi- regular income from paid employment or small informal business. They will use motor transport to go to work, visit clinic and hospital, visit markets, visit friends and relations and participate in social events such as funerals and religious functions. Access distance to transport services will usually be within a half a kilometre. Will have access to bicycles and sometimes motorbikes and occasionally an agricultural tractor. Long distance trips will be made by bus, minibus or train, and not by truck. As with all the previous groups primary school children will walk or cycle to school although journeys to secondary school at the beginning and end of term or at weekends may be made by motor vehicle.

Group 5. The rich. There are very few rich who live permanently in rural areas. They will often have houses in the main towns as well as the country. They will make motorised trips on daily or weekly basis. They will either own cars or make intensive use of taxis. Long distance transport will be made by car, bus, train or aeroplane. Many of the children of this group are taken daily to school by motorised vehicle. They will usually live close to good vehicle access and to transport services.

Transport service operators

Operators may take the form of an individual company or many individual owners, each having a small fleet (perhaps only one vehicle). A company is most likely to operate medium or large-size vehicles, which involves significant investment and organisation support. An individual is most likely to invest on a much lower scale in intermediate means of transport, tractors, minibuses or pickups. They will tend to employ or hire drivers on an ad hoc basis or drive themselves.

Individual operators rarely work entirely independently of one another; they create associations that may be based on individual routes, types of vehicle used, geographical areas or entire countries. Companies and associations can be monopolistic, or highly competitive to the point of bitter rivalry. Companies may be in either the private or public sector whereas associations invariably represent private enterprise.

Where the regulatory authorities are weak, the associations may be very strong, enjoying powerful political patronage, and taking responsibility for quantity licensing, route allocation and setting fares. For motorised transport these arrangements might be very formal and for

intermediate means of transport very informal but the implications are the same. They can act as strong pressure groups to lobby government on behalf of member's interests They may also provide internal support (organising credit facilities for purchase of vehicles and spare parts). Even so, large associations may not be homogeneous, with internal rivalries that can lead to the formation of splinter groups.

Passenger transport users have very little representation; user groups are beginning to be created and find a voice in some cities, but not in the rural context because of the dispersed locations and infrequent use of transport. Furthermore, many rural operators have a monopoly of transport services which leaves users with a 'take-it-or-leave-it' choice.

Regulatory authorities

Regulatory authorities are likely to be government (central and/or local) bodies, but strong operator associations may also impose their own control that can be enforced in draconian style using internal policing. Quality licensing of motorised transport services is probably universal, though the thoroughness of execution is limited by the institutional capacity to monitor and enforce regulations. Quality control (on, for example, vehicle roadworthiness and driver experience) is likely to be a national issue governed by traffic law and administered by central government through regional offices (eg,. Traffic Commissioners; Vehicle Licensing Agency; Driver Testing Agency; etc.)

Fare setting has also been a traditional responsibility of many central governments (perhaps because it has a high political profile). The trend is towards market pricing, but many monopolistic associations have taken over the role of fare setting (sometimes in collusion with central government).

Quantity licensing is more likely to be a local issue, which should be administered by local government (though subject to any relevant traffic law). In the past local governments have not always been equipped to take ownership of this responsibility. Furthermore, they have not had the resources to enforce such regulatory policy as they have framed. In these circumstances these tasks have been taken on by parastatal companies, but increasingly by the more aggressive associations - sometimes by default and sometimes in agreement with the operators. This development has also seen associations taking on the role of managing local government transport terminals (controlling access and managing its finances); this is a prime source of bitter feuding between competing associations, and is not in the transport users interests.

A further imposition of history, which has introduced conflict, concerns ministerial responsibilities for rural transport provision. Traditionally both rural roads and parastatal transport companies have been the responsibility of a public works or transport ministry. With the trend towards decentralisation and the development of local accountability, there has been pressure to bring both rural roads and local transport within the remit of the ministry responsible for local government. Parastatals, which typically operate on a national or regional basis, are not easily devolved to local government. This inflames ministerial jealousies, which are further fuelled by the lack of credibility in local government's understanding of, or expertise in transport operating issues.

Management of rural public transport services

With the gradual demise of many parastatal bus companies, rural public transport has become the preserve of the small-scale entrepreneurs who either drive their own vehicle or employ a driver (often on the basis of a quasi hiring arrangement.) The vehicles that they use are typically old and in bad state of repair, particularly where they are providing services to remote rural areas along poor road surfaces.

The operators usually work in an association that allocates routes and specifies fares and conditions. The association may also have control of the transport terminals, even though

ownership may rest with the local authority. Local government may exercise some of its powers, but the associations still wield most influence on how the transport network operates.

Associations are likely to be bound by laws relating to co-operatives and unions which set out structures, procedures, obligations, funding, etc. Some associations, particularly the larger ones working at regional and national levels, will have paid employees. These include a secretariat, local administrators, terminal staff (eg,. controllers and dispatchers) and in some cases internal surveillance or policing staff. Associations are strong in representing and guarding their members interests, but their weakness may be an inability to substantiate their arguments through well researched analysis, and a tendency to overlook the wider interests of the users of transport and the communities they serve. The latter is partly out of their control: unlike a parastatal or private company, an association has no strong power to influence the quality of service, to (irrespective of the merits) cross-subsidise between routes, encourage interchange between routes or generally provide some semblance of an integrated network. An association may not even be able to enforce its own rules on all its members, and in-fighting is a common occurrence.

With this background it will be clear that very little planning goes into route design. The route structure evolves on the basis of trial-and-error, the availability of terminal space, the contention between drivers, and between competing associations (if relevant), the availability of custom, and the fare levels which can be charged. Where local government exerts some authority on route planning, their actions may simply endorse the modus operandi which the drivers have adopted. Route planning based on analytical techniques is, after all, a complex business requiring expertise which most local governments do not have. Ultimately it is the operators who take the risks of providing services on routes, and so perhaps route planning is best left to them, however they want to approach it. This of course still leaves unresolved the problem of providing services to remote areas which operators cannot justify meeting.

Finding a solution to this problem (assuming there is something approaching a solution) is hampered by the inability of either users, operators (represented by associations) or local government to articulate the transport problem in a quantifiable and analytical manner. The ability to plan a way out of the problem does not currently exist.

Freight transport also has some history of parastatal involvement, though a strong private sector component has usually been apparent as well. Associations of truck operators also flourish, some associations representing both passenger and freight operators and drivers.

Whereas passenger services are traditionally organised by the operators, freight operations are much more directly subservient to the needs of users. This is particularly the case when marketing boards contract in haulage capacity, as required, to service the needs of their regional depots. With the demise of some parastatal marketing boards, some larger truck companies have taken on this role themselves: provisioning farmers, distributing farm produce and even in some cases financing these transactions. In other cases, entrepreneurial wholesalers have contracted hauliers to pick up small loads of farm produce direct from the farm gate.

Responsibilities for services using intermediate means of transport

In the same way as for larger motorised transport local government may regulate the use of intermediate means of transport. These types of regulations may relate to route licenses and acceptable conditions for use of animal transport. However, generally these regulations relate to the use of intermediate means of transport in urban or peri-urban areas. In the truly rural areas national or local government organisations tend to play only a limited role with the exception being the activities of the agricultural extension services that in some countries will promote certain types of vehicles.

The role of non-governmental organisations is particularly important with intermediate means of transport in the promotion, design, manufacture and financing of vehicles. NGOs tend to

work independently of government but lobby them to encourage acceptance of intermediate means of transport in the planning and regulatory process.

The use of intermediate means of transport tends to be more on a private use basis with occasional hiring but where intermediate means of transport are more numerous and predominantly providing a transport service associations, whether formal or informal, will form in exactly the same way as for rural public transport services.

Professional transport bodies

The professional transport bodies have a role to play in developing a responsible approach to transport provision. Some of these have the ear of government on transport policy issues, since they are seen as a focal point of the transport industry. Their work on raising professional standards should not go unrecognised, and needs to be encouraged at all levels.

Many universities, polytechnics and technical schools provide courses relevant to the transport industry. These courses range from degrees in transport planning to certificates in vehicle maintenance. These courses are only sustainable if appropriate career paths are available, and/or if employers are willing to sponsor candidates. Neither of these conditions is supported by the continuing demise of parastatal transport companies, and the absence of a transport planning cadre within most local governments. Existing courses are also very weak in recognising the contribution of intermediate means of transport to both rural and national transport systems. It is at the training stage that attitudes are most likely to be changes to foster acceptance. Some countries have seen the establishment of purpose training schools for the transport industry, covering all grades of interest from the driver to senior management. The parastatals and bigger private transport companies have largely supported them and hence (as with polytechnic courses) their sustainability has often been in question.

Legal framework for the transport sector

The legal framework of the rural transport sector will largely be found in the various traffic Acts (Ordinances, Amendments, Legislative Instruments), their Schedules and statutory provisions empowered to the responsible Minister and/or his agents. Parastatal transport companies and highway administrations will have their own acts of establishment, which set out aims, duties, powers, procedures, funding, accountability, etc. Other law which may be applicable may be associated with local government powers, conditions of employment, company and union law, and government revenue generation (the imposition of taxes and excise duties).

Traffic law invariably covers in some form the following:

- vehicle construction and use
- registration and licensing of vehicles, including roadworthiness checking
- licensing of drivers of vehicles, including their qualification and instruction
- regulations relating to the use of the highway including safety provisions
- police powers
- traffic offences and penalties
- insurance requirements

Many of the provisions in traffic law are inadequate for modern traffic and transport conditions. Laws often date back to a colonial period when traffic was not significant. In the meantime there has been increasing volumes of traffic, a broader base of vehicle ownership, a wider range of motorised and non-motorised modes and great improvements in traffic safety awareness and the techniques which can be deployed. Given these changes and an increasing concern for safety and the environment, there is a need to modernise traffic law.

Private transport companies and transport associations will be covered by company law and co-operative or union law respectively. These set out the conditions and rules by which these organisations must operate in the public interest.

Local government law may be particularly relevant to transport operators in the towns from which rural operations emanate. Transport terminals are typically owned by local government, which may have statutory obligations concerning passenger safety, the maintenance of the terminal and hence levies on use. In practice, the evidence is that terminals are very poorly maintained and managed, with responsibilities often abrogated by local government to the operators.

Local government are also likely to have powers to control the numbers of vehicles in use for provision of services, as well as the routes on which they ply. These powers may be effected in a very loose and non-effective way, particularly where the operators form a powerful voice, or where they can easily manipulate political support.

The raising of taxes and duties affects transport operators primarily through the price of imported vehicles, as well as the price of fuel. Schedules will set out the amount of excise duty applicable on imported vehicles. Rates may be weighted to deter the importation of certain vehicle types and ages. Rates can also be used by government as an investment incentive (eg,. waiving excise payment to encourage importation of PSVs).

PART 2
Implications and ways to address rural mobility

Economic efficiency and profitability

Financial profitability is arguably the most important single factor determining whether or not a particular technology is adopted. Many other factors, including status and social benefits play a part. Nevertheless, a technology type is used because it generates income, saves valuable time or increases the efficiency of a profitable venture. This is one reason why most transport technologies are found in urban areas and around markets, where the income-generating potential of transport devices can be high. The concentration of intermediate means of transport in areas of high economic activity contrasts with the shortage of transport technologies available within rural households. This is despite very clear needs (arguably more social than economic) to reduce the drudgery and time requirements of household transport tasks, including water collection.

Many successful types have been associated with transport hire (boda-boda bicycles, Asian cycle and motor rickshaws) or marketing opportunities. Animal-drawn carts have often been associated with greater use of manure and forages, increased production, more timely harvesting, larger circles of trade and opportunities for income from local hiring arrangements. Rural people without carts may be willing to pay very high prices for transport services (examples from Zambia included one bag retained for every four or five transported—Starkey, Dibbits and Mwenya, 1991).

Since the adoption of transport innovations leads to time saving and economic opportunities, it also results in greater economic and social differentiation. Those able to profit from investments in transport have greater productive capacity than those who cannot. While those with transport devices gain financial benefits and/or enhanced social status, those without feel increasingly impoverished in comparison. The impoverishment may be relative (no actual change in circumstances) or absolute (those with transport may take away income generating options or employment from those without). Since men are the main adopters of different forms of transport technology, gender differentiation often increases, with women increasingly marginalised. An example of this was reported from Mali, where marketing systems changed as men increasingly used animal-drawn carts (and motor vehicles). Women traders without donkey carts were tended to be restricted to within-village transactions, reducing their incomes and independence (Ruthven and Koné, 1995).

Many, perhaps most, programmes promoting intermediate means of transport have developed analyses that have demonstrated their potential profit and affordability. In some cases, user experience verified this (eg, ox carts in Zambia). In other cases, it did not (eg, cycle trailers in Ghana). The same is the case for motorised transport services where the lack of service to many rural communities demonstrates a lack of financial viability. Organisations and projects need to be realistic about the likely economic benefits of their preferred choice of transport type.

Local transport, roads and rural development

Isolation is argued to be one of the five factors (isolation, powerlessness, vulnerability, poverty and physical weakness) which contribute to the deprivation trap Chambers (1983). Isolation will increase marketing and production costs, slow down the diffusion of new technologies and techniques, and limit access to education and health facilities. Improved transport, as part of a multi-disciplinary approach to poverty reduction, plays an important role in improving access to vital social and economic facilities through more reliable and lower cost access. However, the research from Sub Saharan Africa points to high transport costs, unreliable and infrequent vehicle services with the inevitable implications that this has

on rural development and poverty eradication. It is argued in this section that this is in part due to an over emphasis on physical infrastructure and under emphasis on the vehicle services themselves (Dawson and Barwell, 1993; Carapetis et al, 1984).

Modelling transport costs and the benefits of rural road investment

The evidence for new road investment to act as a stimulant for rural development and poverty alleviation is mixed, as borne out by the large number of ex-post road impact studies which show a very wide range of response. Good communications are necessary for rural development but that on their own they are not a sufficient basis for success (Howe, 1981). The rural environment is highly variable and complex and hence it is difficult to predict how a rural community might respond to better accessibility and reduced transport costs. There is often the need for complementary inputs such as agricultural extension advice, fertilizers and credit and the better use of local resources, the efficient allocation of funds and an enabling environment for transport services (Beenhakker, 1987; Howe, 1997).

The adequate provision of low cost rural transport services are also dependant on a wide range of inter-related factors (eg, local technical and managerial competence, market efficiency and information, good driver behaviour) and not just on the quality of infrastructure on which it operates. In the planning of infrastructure the quality, frequency and cost of vehicle services has been often overlooked. Attention has often been wrongly focused on a theoretical model rather than on the magnitude of transport cost changes or the sensitivity of response. For most smallholder agriculture marginal changes in transport costs will often make little difference to the supply of agricultural inputs. The major input is labour, with people walking a few kilometres between home and farm. Only small quantities of fertiliser, insecticides or improved seeds and planting material are used which travel any substantial distance. The major impact of better transport is likely to come from the reduced costs of transporting produce to market.

There is also growing evidence that transport planners have been over predicting the benefits (in terms of reduced vehicle operating costs) from improving rural infrastructure through upgrading existing vehicle access, and hence the price signals sent to rural communities may not be as strong as previously thought. It is far more important to ensure initial basic vehicle access in the first instance.

Transport costs and agricultural development

The proportion of transport charges that are accounted for in the final market price of agricultural produce will vary with a range of factors such as commodity type, the efficiency of the transport and marketing sectors and travel distance. Year-to-year fluctuation in prices will also have an effect. Studies carried out in Ghana demonstrated that wholesale transport costs as a proportion of final market price were in the range of 3.5-8 % for the main staple crops (maize, yam and plantain) over distances of 120-200 km, 11% for maize (420 km) and 25% for tomatoes (360 km). However, the impact of total transport costs on agriculture will often be higher than these figures indicate because the critical factor is the relationship between transport costs and what farmers receives for their produce at the farm gate. Both marketing margins and transport costs need to be subtracted from the final market price. There are often considerable costs involved in moving produce inefficiently by headload from field to roadside or village. This may either be represent an opportunity cost in time and effort if family labour is used or an out-of-pocket cost if labour is hired for the job. When this is done a very different picture may emerge. For example one estimate suggests that African farmers may only receive between 30-50% of final market prices compared to 70-85% received by Asian farmers with most of the difference going on transport costs (Ahmed and Rustagi, 1987).

The effect of reducing the costs of transporting market produce on agricultural productivity can be estimated using agricultural supply price elasticities. These have been shown to lie in the range 0 to 1.5. Hence if it is assumed that transport costs of moving goods to a major

urban market are equivalent to say 30% of farm gate prices and that agricultural prices are set at the urban market then, a reduction of total transport costs by 20%, which is totally passed onto the farmer, will induce a rise in farm gate prices by six per cent. If it is also assumed that the total agricultural supply elasticity is +1 then one may estimate that total agricultural output would rise by about six per cent.

The above analysis has largely assumed that changes in transport costs will be passed to farmers and not go to transporters, food wholesalers and retailers or the final urban consumers. Competitive transport and food marketing is required to ensure that the benefits from reductions in transport costs are passed on to farmers and to final consumers. Unfortunately in many parts of the developing world this is far from the case.

For example, within the Ashanti Region of Ghana in one month the price of cassava was reported to be six times the price in one District market compared with another! And to transport produce from the lowest price market to the highest price market would have accounted for around 5 % of the difference in prices for maize and plantain and around 15% for yam.

Besides transport costs, other factors that can account for a wide range of prices, these include small volumes, poor price information, commodity perishability, differences in storage and retailing costs and a monopolistic marketing system. For example at the village level, travelling wholesalers will travel together to a village and agree prices before they arrive. Individual farmers will often have little choice as to whom they will trade with. More often than not it will be with one travelling wholesaler with whom the farmer has a long standing relationship, this is often strengthened by a credit agreement. For many farmers, indebtedness will force them to sell at peak harvest time when prices are low.

The price of transport is not the only disincentive to increased agricultural production. There is evidence from many countries that crops remain un-harvested, or are spoiled once they have been harvested, because of an inadequate supply of vehicles at harvest time. For example, it was estimated that in some regions of Tanzania that after the 1987/88 harvest that up to 89% of harvest remained stranded with typical figures in the region of 10-40% (Gaviria, 1991).

Rural transport and social development

While conventional appraisal and evaluation of transport projects tends to concentrate on agricultural benefits, there are considerable non-quantifiable benefits to communities and economies from improved access to economic and social facilities. Common journey purposes include:

a) trips to market for buying and selling
b) grinding mill trips
c) education trips
d) social visits and events
e) health visits
f) religious trip making
g) trips for employment
h) visits to post office and to telephone
i) transport of harvested produce

Although not specifically identified in figure one trips to government offices to obtain agricultural loans, agricultural advice, new seeds etc. and pursue land claims are also very important. Clearly long distance trip making is an important component of life in vibrant rural community. If transport is time consuming and/or expensive then rural life will inevitably suffer.

In a livelihoods perspective social interaction is recognised as important for maintaining social links (ie, social capital) and helping to contribute to personal security in times of need

and crisis. Social visiting is not only important because people need social interaction for their personnel welfare, but also because it provides a flow of social and economic information.

Regional differences in transport costs

Rural Sub Saharan Africa has suffered from higher rural transport charges than anywhere else in the developing world. The impact that this has on their economic and social development must be considerable. A comparative study of short distance rural transport (below 30 km) has shown that Ghana and Zimbabwe have transport charges that are two to two and half times more expensive than for Pakistan, Sri Lanka or Thailand. In this case data was collected from a variety of different types of vehicles including tractors, power tillers, pickups and trucks.

A similar picture emerges for long distance transport where the evidence suggests that freight transport costs and charges in much of Africa are also consistently higher than comparable costs in Asia. Long distance freight transport tariffs in Francophone and East and Southern Africa have been found to be between three to five times higher than tariffs found in Pakistan, Vietnam, Indonesia and India (Rizet and Hine, 1993; Hine et al. 1997).

There is also evidence to suggest that wide differences in passenger transport tariffs can be found between Africa and Asia. Long distance passenger fares are estimated to be about three times more expensive in Ghana and Tanzania than in India.

A range of reasons have been identified for high transport costs in Africa. The main differences identified are as follows:

a) low utilisation rates brought about by low density of demand and monopolistic practices from transport unions and cartels that ration out available demand at bus and truck parks
b) poor vehicle operating and maintenance practices brought about by poor driver training and knowledge
c) high first vehicle and component prices brought about by a lack of competition.

Within country differences in transport costs

Not only are there differences between countries in costs and charges large differences also exist within countries. For example it has been found in Zambia that compared with long distance (580 km) paved road short distance (24 km) passenger fares on a good quality gravel road were three times the rate per passenger km. In comparison a 74 km journey on a poor quality earth road was nearly seven times as much (Ellis, 1997a, b).

Similarly research carried out in Cameroon, Mali and Côte d'Ivoire has shown that costs of short distance (up to 10 km) local transport were on average six times those of long distance (above 50 km) transport (LET-INRETS, 1989).

The higher charges for short distance rural transport are for a combination factors. The main reasons are lower utilisation, less competition and poorer quality running surfaces. Often smaller vehicles with lower load factors, and hence higher unit costs, are used on the shorter routes. Higher costs will also occur on earth roads in the wet season as vehicles are more at risk of getting stuck

Trip frequency and vehicle numbers

The frequency with which rural transport services operate is dependant on the density of demand, road quality and ability of the rural population to pay for the service. For all of these reasons the frequency of service tends to be quite low. On major routes, between district centres for example, a regular daily service will generally be available. On village routes the frequency of service can decline dramatically. For example, in Mali 50% of communities are within 5 km of weekly transport but only 21% are within 5 km of daily transport. Evidence

from Zimbabwe suggests that the number of motorised trips per person per week in rural areas was only between 0.2 and 0.5 compared with 3.5 in urban areas (SWECO, 1985).

In some of the remotest rural areas of the world where subsistence agriculture accounts for virtually 100% of total household food consumption, the road and motor vehicle may be of little or no relevance in day-to-day transport tasks. In surveys in Zambia, villages with access to motorable roads may only see commercial vehicles three times in a year with other vehicles being used for agricultural extension, delivery of health services and community development visiting the village once a month on average. In these cases rural people routinely have to walk in excess of 20-30 km and trips of 120 km by bicycle are reported.

The availability of motorised vehicles can also be very low. A study in the Makete district of Tanzania in 1987 found only one four wheeled vehicle and three motorcycles for 13,700 people (Dawson and Barwell, 1993). While, in the northern and southern regions of Malawi it has been estimated that there was only one bus per 30,000 people; this falls in the central region to one bus per 45,000 people (Gaviria,1991). Cross country comparisons between Africa and Asia show that representative villages in Asia have far greater access to vehicles than those in Africa. For example, surveys found that villages in Zimbabwe would have on average one motorised vehicle per 300 people which is a fifth of the level in Sri Lanka. The conundrum here is that it appears that vehicle ownership in low income countries in Sub-Saharan Africa is virtually the same as in low income countries in Asia ie, one vehicle per 135 people in Sub-Saharan Africa and one per 138 people in Asia (AAMA, 1996). Although it is recognised that vehicle registration statistics are very inaccurate it does suggest that vehicle ownership in Africa is very urban biased.

Rural transport costs

Vehicle operating costs

Wide differences in operating costs have been found for vehicles working in rural Africa and Asia. These differences are shown in Table 2. For example agricultural tractors are 2.7 and 4.6 times higher in Zimbawe and Ghana than in Pakistan while truck operations are 10 times higher. (Ellis, 1996)

Table 2: A comparison of vehicle operating costs

Vehicle Type	Thailand	Sri Lanka	Pakistan	Ghana	Zimbabwe
Transport:	1994 US cents/t/km				
Pickup truck	8.7		13.7	39.0	
Truck [8-11 t]			2.1	20.6	21.4
Agricultural:	Cents/hr				
Tractor		320	270	1240	740
Power tiller	123	127		357	

A detailed examination of costing and vehicle performance for freight vehicles also found that Africa was at a substantial disadvantage. Table 3 shows the difference between the operating cost components of a two-axle truck in Tanzania, Indonesia and Pakistan.

Table 3: Estimated composition of operating costs for two axle trucks

	Tanzania	Indonesia	Pakistan
	1995 US cents per km		
Capital costs	10.6	2.7	1.8
Fuel	15.4	5.8	9.3
Crew	2.7	3.2	3.2
Oil	1.0	0.7	1.0
Maintenance	6.1	4.3	2.2
Tyres	7.8	1.2	1.1
Overheads	6.5	1.8	2.4
Total	**50.1**	**19.7**	**21.0**

The rest of this section will examine the background to higher fixed and variable costs in Vehicle Operating Costs (VOCs) to gain some insight for the reasons for the large differences between countries and the types of interventions that could be taken to reduce them. The major causes for these differences include the cost of vehicles, levels of utilisation, levels of routine maintenance, the cost of fuel and value of passenger time.

Cost of vehicle

Vehicle prices in Africa have been found to be higher than in Asia but the precise reasons are not known. Many examples have been found where comparable new vehicles are two to three times the untaxed price in Africa, compared with Asia. The small market size (ie, low density of demand) coupled with exclusive dealerships will obviously play a part in keeping import prices high. Tied aid deals, corruption or the influence of government owned companies and parastatals may also be important. A lack of competition in transport markets may also encourage a lax attitude by those who are responsible for buying new vehicles so that they do not demand better terms or seek out new suppliers.

It has long been recognised that substantial price differences for the same product can persist for long periods in different national markets. However exchange rates and differences in taxation can disguise the differences to some extent. Differences in vehicle prices in different markets are not uniquely confined to Africa and Asia. Car prices in the UK have been higher than in the rest of Europe for over two decades. Recent press publicity has indicated that for certain models prices might be 60 per higher in the UK than in the cheapest European market. Although there has been some reluctance to tackle this problem (perhaps because of the implications for manufacturing employment) there are recent indications that steps may now be taken to introduce more competition and restrict the monopoly power of exclusive dealerships.

By concerted bulk buying policies (by government, aid agencies, or larger commercial firms) the prices of new vehicles could be substantially reduced. There is also a case for sourcing vehicles from other developing countries. For example, many Asian countries produce intermediate means of transport at a price and quality which is unlikely to be matched in Africa and Latin America. Exclusive dealerships (dealing with relatively small numbers) also make the prices of spare parts very expensive (Rizet and Hine 1993, Hine et al 1997).

There are a number of ways in which vehicle prices can be kept low and therefore more affordable for rural people. The evidence is that low vehicle prices do feed through into higher demand for the vehicle. Lower import duties and taxes will make final prices to the consumer much more attractive although has a cost to the state in reduced tax income. Care has to be taken in adopting this type of policy because it can lead to over supply of vehicles or distortions to transport markets as is the case in Pakistan where tractors are used for transport tasks which should be undertaken by trucks.

This type of policy is also relevant for intermediate means of transport, for example, in Malawi restrictions on import licenses for bicycles led to a cartel of suppliers who increased bicycle prices. The subsequent decline in sales was only stopped when the Transport Planning Unit brought about a policy shift which increased the number of licenses issued (IT Transport, 1996).

Vehicle prices can also be kept low through local manufacture of vehicles or through the importation of completely knocked down (CKD) vehicles instead of already assembled vehicles. It is through local manufacture that considerable cost savings can be made.

Vehicle utilisation

Levels of vehicle utilisation are extremely important in determining the burden of the vehicles fixed costs. Table 4 shows the levels of vehicle utilisation for various modes between countries. There is a significant differences in the utilisation rates between countries. Utilisation rates for motorised vehicles can be more than twice as high. There are also similar

differences in animal based transport. The ox cart operates for over 4 times the number of hours in Pakistan than in Zimbabwe.

Table 4: Levels of utilisation for various vehicles between countries

	Thailand	Sri Lanka	Pakistan	Zimbabwe	Ghana
Pickup (km/year)	61,000	-	44,000	-	29,000
Tractor (hours/year)	-	1,440	1,900	750	800
Power tiller (hours/year)	500	740	-	-	400
Ox cart (hours/year)	-	875	2,000	400	-
Donkey cart (km/year)	-	-	4,600	1,600	-

Similar findings have been found from freight studies. For example, the average annual utilisation of two and three-axle trucks in Tanzania was found to be 60,000 km compared to 80,000 km for Indonesia (Hine et al, 1997). Annual utilisation for tractor and semi trailers in Pakistan was found to be 123,000 km compared to 50,000 km in Francophone Africa. Additionally it was found that the vehicles in Francophone Africa had 34% empty travel compared to only 12% in Pakistan (Rizet and Hine, 1993).

Empty running has been a major cause for concern in China. A study of long distance freight transport found that 43 % of vehicles surveyed, and 32% of reported vehicle kms were empty. This is more than twice that observed in surveys in Pakistan where an extensive network of transport brokers (or freight forwarding agents) who can match loads and thus reduce empty running and increase utilisation has given it one of the most efficient road freight industries in the developing world. A computer based matching analysis found that there was ample scope for reducing the level of empty running in China with potential savings in the level of empty running at between 6 and 9 billion vehicle kilometres per year. Overall it appears that the current high level of empty running is a result of a poorly developed network of forwarding agents in the country (Hine et al 1995).

Routine maintenance

Ellis (1996) analysed repair and maintenance costs for three different classes of vehicles; pickup, truck and power tiller. The results showed that repair and maintenance costs were between 5 and 16 times higher in the African countries than for the lowest values found in Asia. These differences point to serious deficiencies in vehicle backup services and routine maintenance.

Routine maintenance is vital for the efficient operation of a vehicle and includes the day to day activities which must be undertaken on a vehicle to arrest the premature wearing of moving parts or failure of components. The activities include checking or changing the engine oil; cleaning or replacing oil, air or fuel filters; maintaining bearings, shock absorbers and springs; tightening up of nuts and bolts; and the general day to day care of a vehicle.

The care with which operators look after their vehicles is obviously going to have a large impact on the total repair bill. This is supported by the data; in general routine maintenance accounts for a much smaller proportion of the total repair and maintenance bill in the African countries studied than in the Asian countries. For example, in Ghana routine maintenance only accounted for 8.6% of total repair and maintenance costs for a power tiller compared with 50% in Thailand.

Although there may be cultural reasons for poor routine maintenance, it can also be attributed to an un-competitive operating environment. Competition encourages low cost practices in a range of ways. Because of competition, drivers become aware of all aspects of their vehicles' performance and operating costs. In Pakistan nearly all goods transport drivers are given responsibility to find loads and maintain their vehicles. Most keep detailed accounts of their operating costs. Vehicles travel slowly (average spot running speed is 54 km /h) in order to

save fuel and reduce maintenance costs. The engine oil is changed frequently for the same reason. (Hine and Chilver, 1994).

Cost of fuel

The cost of fuel represents a significant component in total vehicle operating costs, at between 10 and 40% for many passenger and freight vehicles. It is also the cost which vehicle operators are most sensitive to because they have to fill-up on a daily basis. As such, a rise in fuel prices is often the trigger for a rise in transport charges. When fuel levies and taxes are set, it is important to consider that any subsequent change in the final price of fuel will have an immediate effect on the cost of transport to the consumer, particularly in remote rural areas.

The price of fuel, net of tax, is not uniform around the world. The evidence suggests that African countries pay very much more for fuel than comparable Asian countries. Clearly the costs of distributing fuel are higher when volumes are small, there is often a lack of competition in the provision of fuel because government parastatals are the sole distributors. The large oil companies often act only as retailers.

Although some countries try to adopt uniform pricing across the country, it has been found in some countries that there can be large differences in fuel prices between urban and rural areas. For example in Zambia fuel prices in rural districts can be up to 20% higher than in Lusaka.

The value of passenger time

A key benefit of any measure to improve rural transport and accessibility is the reduction in travel and waiting time. The valuation of passenger travel timesavings has not been treated consistently within rural transport planning projects. Passenger timesavings are frequently omitted, sometimes on the mistaken basis that poor people who are not in paid employment do not value their time. Until relatively recently when (non working) passenger timesavings were valued the rate chosen was based on the "one third of wage rate" rule. Such a valuation was derived from research carried out in the 1960s and 1970s. Recent research using Stated Preference techniques from many countries has conclusively shown that the “one third of wage rate” rule is false. There is now increasing evidence that poor people value their time at a much higher ratio, in relation to their income, than richer people do. For example surveys carried out in Indonesia found that although the median income of car passengers was over five times that of bus passengers their median value of time was only twice as much. One estimate suggested that bus passengers in Indonesia had a mean value of non-working journey time of just under 60% of the manual wage rate (Hine et al, 2000)

User perspectives and gender

Obtaining user perspectives

Users are not a homogenous group. They differ according to income, occupation, age, gender, ethnic background and other social and cultural characteristics, all of which influence their preferences and needs. Programmes involved with promoting rural transport need to understand these diverse user perspectives. With the expertise of hindsight, it is clear that many transport projects failed to understand users’ needs and wants before they launched promotional programmes. Examples include the disappointing adoption of cycle trailers by women in Ghana and wooden wheelbarrows by women in Tanzania (Starkey, 2000).

Before companies launch products, they try to understand the requirements, attitudes and preferences of potential customers. Market researchers are charged with predicting and defining the needs and wants of people, and the likelihood of products being purchased. Attention is given to the perspectives of the different categories of potential users and the factors that influence their decision-making. Reasons for the success and failure of previous product initiatives are closely examined to learn all the lessons. Understanding user attitudes is crucial for a company’s success.

Rural transport programmes must also learn about the viewpoints of their potential 'customers' in order to understand past experiences and to predict the results of future initiatives. This may involve diagnostic surveys and market research tools such as attitude surveys and focus group discussions. Programmes must take time to listen in depth to those with transport problems, and to transport service providers. This is not always simple, for many different factors influence the opinions of transport operators, users and potential users.

One of the most effective learning situations is to listen as people talk about the advantages and disadvantages of transport solutions with their close associates (family, friends, neighbours or colleagues). However, transport planners and the 'customers' can be separated by differences in their work, education, income, gender, age, language group, class, religion and ethnic background. Transport programmes have to find ways of overcoming barriers, and finding out what people really want and are prepared to pay for.

Factors influencing user preferences

Some user preferences relate to aesthetics. People may prefer white oxen, blue carts or elaborately decorated pickups. Such preferences may be based on long-standing cultural traditions or may be based on more recent experiences of quality products.

Social status and prestige are often very important, and may influence the adoption and use of transport technologies in a variety of ways. People may put social costs and benefits above economic ones. A low-cost transport solution may make economic sense, but people will spend more money to obtain one associated with higher status (mountain bicycle, Mercedes car). They may be prepared to spend money on painting or decorating (ornate ox carts, multiple reflectors on tricycles). Similarly, people may choose not to use a low-cost transport solution for fear of social ridicule, even though its use would bring economic benefits.

Depending on the local circumstances, similar transport solutions may be prestigious or lowly. Surveys in rural Uganda emphasised the prestigious nature of bicycles (Malmberg Calvo, 1992; 1994b). Motorcycles had a higher prestige, as in other parts of the world. Animal-drawn carts have attained a high prestige in rural Mali (young women want their future husband to own a cart). In peri-urban South Africa, people have even denied they own and use carts, because in the prevailing culture, prestige comes with pickups, and not with non-motorised transport. Horses have high prestige in Latin America, and other areas, while donkeys are often 'the horses of the poor'. The drivers of cars, or horse carts, may look down on the donkey owners, but in their own villages donkey owners may have status, since others have nothing.

Some people regard human- and animal-powered transport as lowly and backward. In India, Indonesia and Pakistan urban planners have banned cycle rickshaws from some cities, due to 'traffic congestion' even though congestion has seldom been reduced. During recent international transport seminars, transport planners from developing countries have expressed surprise on learning that hand carts, cycles and transport animals were 'still' used in Europe and North America. They were surprised to see 'low status' technologies being used in 'high status' and economically developed countries. In fact, changing perceptions have led to recent increases in the use of certain local transport solutions in industrialised countries. Positive attitudes have led to increasing use of bicycles in The Netherlands and Nordic countries, due to increased environmental awareness, faster access due to congestion and improved health benefits. The executive scooter recently became a high status, local transport device.

People's attitudes and preferences are not static and can change gradually or quickly. Fashions come and go. More importantly, items and practices considered socially unacceptable, may become acceptable. Women may start to ride bicycles and donkeys may be brought into the village for transport. Attitudes may evolve due to changes in the social and economic environment or they may be induced by promotional activities. Transport

programmes need to keep abreast of cultural changes and regularly update diagnostic and attitude surveys but also to be proactive in defining the needs for their 'customers'.

User perspectives on comfort and safety

Attitudes to comfort and safety can be paradoxical. People prefer safe, comfortable transport, but will accept low standards. In some cases, they may have no choice. In other cases, people voluntarily accept lower standards, because it is cheaper or more convenient. Many transport devices are loaded beyond reasonable comfort (rural taxis and trucks, buses, urban trains and underground systems). People become resigned to discomfort when travelling in such services: the benefit of the travel outweighs the problems.

People's attitude to safety is even more ambiguous. While many aspects of safety are out of their control, they may not take simple precautions that involve little inconvenience (eg, wearing of seatbelts). Drivers and passengers seldom adopt safety measures unless they are compulsory and enforced. Examples include, crash helmets, seat belts, passenger and weight limits (on cycles, motorcycles, cars, buses and trucks), passengers in unstable positions, driving with alcohol and the fitting of effective lights, brakes, reflectors etc. If there is a choice of vehicles, passengers are more likely to be influenced by the fellow passengers, or the risk of soiled clothes, than which is the safer vehicle. In most of the world, the view of passengers and transport operators is that accidents do happen, but generally to other people. Thus although accidents happen, safety may not been perceived as a key problem.

Gender and unequal access to transport technology

In many countries, notably in sub-Saharan Africa, women are responsible for numerous transport operations, including transporting domestic water, firewood, crop harvests and grains for milling. African women often spend 15-30 hours a week on transport activities, much more than the men of the communities (Dawson and Barwell, 1993). They often have to carry children at the same time. Girls may be kept out of school to assist with gender-related transport and domestic tasks.

Many local transport solutions are well-suited to assisting the transport of women and their domestic, agricultural and trading loads. Family ownership of transport technologies (cycles, trailers, hand carts, animal-drawn carts) may benefit women indirectly, as some traditional tasks, such as water collection, may be taken over by men and boys using the transport technology (Malmberg Calvo, 1992, 1994b; ITSL, 1998). However, women (and men) value the benefits of mobility and aspire have access to means of transport.

The majority of transport technologies are owned and operated by men. Many fewer women than men ride bicycles or motorcycles, use oxcarts or hire transport services. Sometimes, men and/or women may not wish women to use such devices for cultural reasons. More often, the reason relates to the financial inequalities in gender relationships: women do not have the same access to the money, credit or income-generating options required to make a purchase.

Women, in general, also have fewer resources available to pay for transport services. Women often have less money, and less spending flexibility: their money is allocated for household necessities, like food and clothes for the family.

The problem of unequal gender access to transport is most clear in poor, rural communities, where women's incomes are low and both transport devices and transport services are few. In urban and peri-urban areas, where the employment among women is higher, and transport is more readily available, the gender inequality is less marked for the cheaper forms of transport. This can be seen in most parts of the world. In urban and peri-urban Vietnam, almost half the cyclists are women, and perhaps 30-40% of the motorcyclists. In Laos the number of women on motorcycles is higher (perhaps associated with matrilineal cultural systems). However, in these, and other countries, men drive most cars and pickups.

Gender bias in transport programmes and the 'invisibility' of women

Despite women's clear need for transport technologies and their clear disadvantage and under-representation among transport users, women have tended to be 'invisible' to transport professionals and transport-related programmes (Fernando, 1997). Conventional transport planning has focused on road networks and the long distance movement of produce that is important to the national and urban economies. This has neglected the importance of local transport solutions for short-distance transport in general, and the transport needs of women in particular. Transport projects that say they aim to improve accessibility have often failed to address the clear needs of women as transport 'customers'.

Calls for increased gender sensitivity in transport programmes are growing (Bramberger and Lebo, 1999; IFRTD, 1999). Nevertheless, there remains considerable inertia, gender-insensitivity and even overt sexism among transport-related organisations and within target communities. The perception of women as the 'natural' transporters, particularly in African societies, still militates against initiatives and investments to reduce women's transport burden (Fernando, 1997).

Few, if any, local transport solution programmes have been intentionally biased against women. However, few projects have actually incorporated gender analysis or taken into account that women have less access to information, capital, credit, cash incomes and financially profitable transport activities.

Some programmes have made a clear effort to understand the transport problems of women and reasons for use (or non use) of transport technologies. In one study in Uganda, bicycles were perceived as prestigious devices, allowing men to travel faster outside of the village, thus facilitating trade. Men and women often felt that if women used bicycles, people would consider that they were 'behaving like men'. Men were suspicious about the implications of such liberated behaviour, particularly if it concerned their wives. Bicycles, which only had small carriers, were not particularly suited to many of the transport tasks of rural women (within-village movements and the collection of water, fuel wood and crop harvest along narrow, and sometimes steep, paths). Women's bicycle designs were not widely available, and most women did not have access to sufficient cash or credit to purchase cycles (Malmberg Calvo, 1992, 1994b).

Some programmes promoting local transport solution have made an effort to address such gender imbalances in use. They have involved women in planning processes and targeted information, credit and project actions at female transporters. One such project in Tanzania assisted women to adopt donkey carts (Makwanda, 1994; Starkey and Grimm, 1994). One cycle trailer initiative in Ghana, funded by the World Bank, was specifically intended to help women. However, the project did not fully appreciate and address either the gender nature of cycle ownership and use, or women's transport needs and options (Kauffman, 1993; Salifu, 1994).

Gender and technology choices

Rural transport programmes have tended to promote 'standard' transport technologies, which are almost invariably based on designs developed by, and for, men. They may consider these 'unisex' or gender-neutral, but this is not always the case. Many programmes promoting cycles for women have used bicycles with crossbars, as these have been more readily available and considered stronger for load carrying. However, in Indochina, bicycles without crossbars have been made available and have spread widely. They are often now the main bicycle in use, being used by men and women for cycling and carrying loads. In some parts of the world, including Indochina and Europe, child-carrying seats are widely available. These benefit men and women, but women are often the main beneficiaries.

Gender-sensitive design issues, as well as socio-cultural factors should be considered when assessing and promoting transport technologies. Women in Ghana and Sri Lanka complained

that loaded cycle trailers have been too difficult for them to pull. In Tanzania, women observed that wheelbarrows were unsatisfactory since they need two hands at all times, leaving no hand available for a child. Some programmes have found that donkeys can have particular transport benefits for women. Donkeys are relatively affordable, easy to manage and their ownership is less 'macho' or prestigious than are cattle, horses and camels (Starkey, 1998; Fernando and Starkey, 2000).

People with special needs

Some people, including the elderly, the handicapped, the sick and the very young have particular problems relating to mobility and access. Local transport solutions may be important for improving their independence and quality of life (Clarke, 1999). Such people may benefit from access to standard intermediate means of transport and/or from specialised devices such as hand-operated tricycles, wheelchairs and simple ambulances (eg, cycle-based, animal-based, motorcycle sidecars). For motorised transport services, there should be adjustments for people with special needs, which could be done by simple solutions. In developed countries, this has opened up mobility for this group of people.

With increasing life expectancy and survival rates, these smaller 'niche-markets' are likely to increase in importance, as societies wish to improve the productivity, independence and quality of life of the elderly and people with special needs. Development programmes should be aware of special needs and consider 'mainstreaming' these, perhaps in collaboration with other organisations (eg, specialised NGOs, Ministry of Health).

Safety, welfare and environmental considerations

There are many ways in which local transport solutions can be misused which endanger the health, safety or welfare of the users, of other road users or of any transport animals involved. With cycles and motorcycles, there is a big danger with unbalanced or unsafe loads. Instability may result in the cycle swerving, causing traffic accidents or injuries to the user or pedestrians. Overloading carts, rickshaws, pack animals or vehicles may cause physical injuries to the humans or animals. Unstable loads may topple causing injuries. Inadequate brakes on any means of transport may result in accidents, particularly with heavy laden vehicles in wet conditions. Motorcycle trailers can easily jack-knife, with fatal consequences. Poorly designed harnesses and pack saddles can injure animals. Night-time movement with inadequate lights and/or lack of reflectors can be a danger for all concerned.

Transport users are often poor and disadvantaged people trying to maximise income for minimum expenditure. Income is often maximised by loading to physical limits (rather than safe limits). Expenditure is minimised if money is saved on maintenance and inessential items such as crash helmets or reflectors (if available). Such people's lives often contain many risks and dangers, so there seems little point in reducing loads or spending money just to increase transport safety.

Many transport users have a low understanding and respect of the danger in traffic and drive their vehicle with little care of themselves and others. Some, the most difficult, are aware of safety and welfare issues, but choose to ignore them. They may even seem to take pleasure in beating animals or risking taking an unstable load onto the road. This is unfortunately true for all countries in the world but, for various reasons, accidents are more frequent in developing countries. Life is important in all countries, as are training efforts and promotion of safe driving, loading and vehicle maintenance.

Most road safety legislation concerns motorised transport systems. Safely regulations relating to intermediate means of transport can be important, but legislation is of little value unless there is an appropriate enforcement system. Most countries have laws and regulations that can be used to prohibit dangerous vehicles or make compulsory certain safety devices (helmets, reflectors). The level of enforcement varies greatly within and between countries. Some countries have animal welfare laws, but few have active enforcement systems. In most cases,

there is a need for a combination of legislation, enforcement and education. People need to be convinced of the value of welfare and safety, with some consistent enforcement to ensure compliance.

The safety of local transport solutions can be improved through planning and appropriate infrastructure (Guitink, 1996; Vidanpathiranage, 1999; Litman et al, 2000). The creation of separate lanes and/or routes for small or slow moving vehicles can be particularly valuable. Bicycle lanes are found in many cities in the world, from Amsterdam to Beijing. Bicycle lanes have to be designed carefully to minimise conflicts between pedestrians, bicycles and motorised transport, particularly at turnings and junctions. In Bamako, Mali, a recently constructed road bridge and its access roads have separated pedestrian pavements and cycle lanes (used by bicycles and motorcycles). In some Indian cities, there are separate lanes for pedestrians, cycles, rickshaws and motor vehicles. Such infrastructure has important planning and cost implications, as well as social and economic benefits. Attention to social and poverty reduction criteria ensured that international credit for the Yamuna road bridge over the Ganges in Bangladesh was made conditional on the inclusion of lanes for intermediate means of transport.

Where there are concentrations of transportation devices, there may be adverse environmental effects. This is particularly true in urban areas, as well as around rural markets. Exhaust fumes from motorcycles, cars, trucks and buses cause pollution. Air quality problems are often greatest where there are large numbers of inefficient motorcycle engines and when use of low-quality fuel. Moving from human-powered cycle rickshaws to motor rickshaws increases air pollution. This has been seen in Jakarta, Hanoi and many other Asian cities. In Nepal, three-wheelers with diesel/petrol engines have been banned from Kathmandu to improve air quality. The increasing use of motorcycles for transport in Nigeria poses problems of air quality, as well as the risk of accidents (Howe and Iyioa Oni, 1996).

Transport animals deposit excrement on roads, with concentrations in areas of loading and unloading. This may be considered unsightly and unhygienic by some, although there are generally people willing to collect such fertiliser. In some urban areas, the users of work animals are required to collect and dispose of dung, and a variety of simple collection devices (eg, ‘bun bags’) are available.

Transport operating environment

Effective demand for local transport services

For many developing countries the effective demand for rural transport services in can be severely reduced by the combination of low incomes, low population density and often the relatively high cost of service. Clearly, remote small scale agricultural communities can be at a considerable disadvantage resulting from the high costs of local and regional transport, thus reducing the scope for developing both national and international markets for locally grown produce. Given this scenario, the question that is of interest to planners is the likely impact that interventions to reduce transport costs will have on effective demand. With lower transport costs demand for travel should increase, which will encourage new transport operators into the market and stimulate economic development. The evidence for this is encouraging with estimates of increases in trip making ranging from 0.4 and 2 per cent with a decrease in fares of 1 per cent (Airey and Cundill, 1998; Hine, 1982).

Density of transport demand

The density of transport demand is a function of population density and per capita income. The density of demand is critical to understanding the use made of transport services in developing countries. The greater the size and density of demand, the greater range of loads, distances, route patterns and types of vehicle service that will become viable. In this variable environment with a high density of demand there is a greater possibility to sustain a competitive transport system that will encourage a wide range of vehicle types. A high

density of demand will also encourage a greater road density and better quality of road surfaces.

In general, areas of the world where the density of demand is high transport is often very competitive, low cost, has a high service frequency and, for short distance rural movements, is diversified. In contrast low density of demand areas, tends to be un-competitive, high cost and, rural transport appears to be undiversified.

The major reason for a low density of demand in the African context is a low population density. For example, Sri Lanka has a population density of 263 per sq. km, Pakistan is 150 per sq. km compared to only 66 per sq. km in Ghana, 27 per sq. km in Zimbabwe and 12 per sq. km in Zambia. Therefore for the low population countries there are less people requiring vehicles to transport themselves, agricultural produce, building materials and household goods.

The problem of low population densities in Africa is compounded by the nature of farming systems in Africa which tend to be low input, low output. This is because there are not the land pressures in Africa to force an intensive farming system. With an intensive farming system there is the need to provide more fertiliser, insecticide and other inputs for land preparation, irrigation and animal husbandry. The harvest yield is greater as are any by-products. Again, the greater number of inputs and outputs to the farming system the wider is the scope for specialisation and market agriculture and hence the greater is the demand for transport.

Provision of rural markets

There is a synergy between marketing and rural transport. An efficient transport system will promote an efficient marketing system. Both are critical to rural development. However, the presence of markets also constitute a means by which the effective demand for transport can be increased. A market acts as a point where goods and people are amalgamated together and thereby concentrating the demand for transport. Where populations are dispersed markets are also likely to be dispersed with long average distances to market and people less likely to make the trip. This is an important consideration for the demand for rural transport services where, if distances become too large, a particular transport type can become non-viable.

In addition, one of the most effective ways that farmers have of getting the best price for their produce is for them to sell their own produce directly to final consumers at rural or urban markets, and thus bypass the normal marketing system. Although farmers do not have the economies of scale of travelling wholesalers it is often recognised by urban dwellers that the keenest prices are often provided by the farmers. Farmers bringing their own produce to market represent a very important way of limiting the power of the marketing cartels. However there is usually little support by the authorities for this type of ‘unofficial’ trading and farmers are frequently harassed as they attempt to sell informally at bus and truck parks. As far as possible facilities should be provided, at minimum cost, close to the transport terminals at urban markets so that farmers can sell their own produce without being disadvantaged or harassed in the process.

Whether farmers rely on travelling wholesalers, traders, parastatals or large private marketing companies, all of these intermediaries reduce the farmers bargaining power, and critically, it reduces demand for transport services and the supply of vehicles available for rural people.

In Cambodia the improvement to rural and urban markets has been identified as a key component of rural accessibility planning. The Ministry of Rural Development identifies priorities to improve markets using the same integrated rural accessibility planning (IRAP) that is used help improvements to rural roads and access to other key facilities.

Provision of physical infrastructure

Despite disappointing results from the provision of rural infrastructure, the quality and planning of roads, tracks and paths play an important role in determining the costs and frequency of vehicle operation. The following sub-sections put a vehicle operator's slant on the need for infrastructure.

The need for basic access

A reduction in road surface roughness (and its consequent effect on vehicle operating costs) is the main criterion used to the improvement of main and secondary roads in developing countries. Roughness reduction is also used as justification for upgrading earth feeder roads and tracks to gravel road standard. Despite this emphasis on roughness reduction it is far more important to ensure that year round basic vehicle access is established in the first instance. Roughness reduction is very much a secondary consideration in comparison with the consequences of an impassable route.

Because of the wide difference in carrying capacity and productivity between different modes of transport an infrastructure improvement which induces a change of mode (eg,. from head loading, pack animals or bullock carts to transport by truck) is likely to have a much larger impact on transport costs than any impact of reducing vehicle operating costs from improving road surfaces. Calculations from Ghana suggest that the effect of upgrading a footpath to a motorised track is over a hundred times greater than that of upgrading the same length of earth track to a gravel standard road.

Interconnectivity of routes - redundancy is not redundant

Where more than the minimum number of links and length of road are present on a road network, the network is said to exhibit redundancy. In providing accessibility to remote rural communities road engineers and planners often attempt to minimise their costs by avoiding redundancy. One result of this is that many rural feeder road networks are characterised by dead-end routes. The end of the route may occur at a town or village or at a natural obstacle such as a river or mountain. Sometimes these dead-end routes may, as in the case of Northern and Eastern Provinces in Zambia exceed 100 km. From the transport operator's point of view a major problem with these routes is they pose a higher risk in terms of load factors and revenues and may also involve more costs should a breakdown occur. Another disadvantage is that should the road become impassable, the rural community will become isolated from vehicle traffic.

Where there is an inter-connectivity of routes potential demand for transport services can be maximised. There is less chance of poor load factors and rural communities can respond to a wider range of market opportunities. With through routes traffic volumes will increase both because of greater demand and because operators can travel a route "on spec" with a reduced risk of an empty return journey. With a greater number of transport operators using a route there is then a chance of competition to become established in the provision of transport services.

Spot improvement strategies

It is becoming increasingly expensive to maintain, and periodically replace, a gravel running surface over the entire length of rural roads. Firstly, many good sources of gravel have already been used and secondly there is increasing resistance from farmers to allow their land to be used for gravel extraction. In most cases, it is unnecessary to provide a full gravel road to maintain basic access and good traffickability. In most situations problems occur over relatively short road lengths of between 10 and 250 metres in places where drainage becomes a critical factor, in total these road sections do not normally exceed about 10% of the road length. Where access is threatened a programme of properly engineered spot improvements, will provide the most cost effective solution.

To maintain passability and traffickability it is vitally important that even low trafficked roads are properly maintained. For example, a low cost labour intensive maintenance regime such as the 'lengthman' system can help maintain the traffickability at low cost. This may be supplemented by tractor-based technologies and a capacity for spot improvements such as in the new Kenyan 'Roads 2000' approach.

How to address seasonal access

The nature of seasonal impassability on rural infrastructure has also been misunderstood. Although in some areas long periods of impassability do occur in areas such as on the flood plains of major rivers. More usually roads are closed for short periods, a few days or a few hours at a time, followed by longer periods of reduced traffickability. Research into seasonal impassability in Tanzania found that complete road closure was rare but that on poor quality roads seasonal traffickability (defined as wet season traffic as a percentage of dry season traffic) dropped to 35%. In addition, it was found that the movement of pedestrians and other non-motorised means of transport actually increased during the wet season presumably because of the poor availability of conventional motorised vehicles (Ellis, 1997c).

The major issue appears to be the accumulation of road sections where the going gets difficult, but not impossible. Here some operators are reluctant to take the risk of getting bogged down or encountering very long delays and there is an imperfect market mechanism to compensate the operator for this extra risk. However, in many areas higher fares are charged during the wet season.

Heavy vehicles can cause substantial damage to lightly built rural roads. This is particularly the case during and just after rain and some countries will put temporary road barriers down to stop all traffic. Another solution, used in Cambodia, is to erect two concrete posts on the carriageway in order to prevent wide vehicles from passing. For this to be effective additional fences or deep ditches on either side of the road may be required.

It is not just heavy vehicles that can cause damage to roads. Ox carts, with metal banded wheels can create problems with ruts. The concrete posts used in Cambodia also stop ox carts. Even though most farmers own ox carts, they are prohibited from using the local access roads. Only those with cycles, motorcycles or pickups can use them. A similar conflict of interest was noted in Madagascar, where transport planners discussed prohibiting ox carts even though they were the most common road vehicle (Starkey, 2000). There is urgent need to find ways of protecting rural roads, without marginalising local cart-owners.

Appropriate standards

On most rural roads (outside of the primary and secondary network) traffic volumes are below 50 motorised vehicles per day and on many are below 10 vehicles per day. With such low traffic volumes, the need is for maintaining vehicle access and traffickability through the year. Initially the width and geometric design of the road should be appropriate to the volumes of traffic. In some countries large sums of money have been wasted in building roads to high geometric standards with excessive carriageway widths for these low volumes of traffic. It is sometimes argued that roads need to be wide to allow vehicles passing room and to avoid accidents. A road with a daily traffic volume of 10 will have 0.05 vehicle-to-vehicle conflicts per day per km assuming a speed of 40 km/h and this will increase to 1.3 conflicts per day per km if the daily traffic volume is 50. It is clear from these simple calculations that, provided there is little other non-motorised traffic, a single lane road, (ie, with a running width of 3.5 metres) with some provision for passing, is all that is required for very low traffic volumes.

It is important to consider that, in terms of distance, most rural transport journeys are made on the primary and secondary road network and that efforts to improve rural roads should not ignore the importance of maintaining this network to a reasonable standard. There is evidence that a number of donor sponsored programmes designed to help the rural poor have resulted in very high standard feeder roads leading onto important secondary and primary roads that

are in complete state of disrepair. Hence it may be argued that the donor programmes have contributed to a misallocation of resources.

In addition, it is always important to assess alternative solutions to access problems. In this context access may best be provided by ensuring basic access in conjunction with modern communications devices to maintain regular contact with the outside world.

Institutional arrangements and involvement of stakeholders

There are institutional reasons why market failure occurs in rural areas. In areas of low demand there is insufficient market information flowing between operators and transport users about price and demand. Because rural communities are small and dispersed they are also not effective in applying pressure to operators or transport organisations where they feel service is inadequate or too expensive. In addition rural people have insufficient information to make effective choices on vehicles that can be effectively operated in the rural environment.

These problems also apply to the provision of rural transport infrastructure, and the need for the participation of a wide range of stakeholders. These include rural people, community groups, farmers' associations, transport associations, local and central government as well as NGOs and donors. An integrated approach to rural transport development can be obtained by encouraging these stakeholders to consider rural transport operations in conjunction with infrastructure considerations (Malmberg-Calvo,1997).

Local level institutions need to represent the interests of rural dwellers and to provide information on vehicle technologies that may be available to them. Surveys carried out in Asia suggest that the role of agricultural extension agencies is instrumental in providing knowledge and training in new technologies to rural communities and communicating back to urban based policy makers, manufacturers and vehicle importers the needs of rural people. While agricultural extension agencies are primarily set up to promote agriculture, many of the technologies which they use are multi-purpose in that they are just as useful for transport, (examples include the use of animals and carts, tractors and trailers and power tillers and trailers). As transport and agricultural matters are so inter-related it is possible that extension officials could also take responsibility for transport issues and help provide advice on appropriate vehicles for transport as well as agricultural purposes.

Governments and donors also need to take a direct interest transport services when investing in rural roads programmes. New construction or rehabilitation works do not necessarily go hand in hand with an increase in service provision. Targets need to be set on the subsequent frequency and cost of service following road investment. The targets should be quantified and a strategy developed to ensure that these targets are met. In Zambia, for example, one of the objectives of the Roads Sector Investment Programme (ROADSIP) is to provide "an enabling environment for improved road transport services and increasing the truck and bus fleet by at least 20% in rural areas". Unfortunately, the underlying assumption was that the target would be achieved by improving the quality of the infrastructure. No strategy was developed for improving the efficiency, frequency and cost of service of the existing fleet of vehicles.

Although transport unions and association can introduce un-competitive practices there is a role for these organisations in promoting the interests of rural transport operators and travellers. An example is the Transport and Public Association of Zambia (TPAZ) which was formed to serve the needs of rural travellers in Zambia. TPAZ drew its members from private operators of 1-10 tonne trucks who predominantly operated from provisional and district centres to rural areas. TPAZ encouraged its members to put seats and canopies at the back of the truck to increase passenger comfort and safety. They also tried to import 1300 pickup trucks, duty free, from South Africa. They managed to have the duty on the vehicles waived by government and they charged their members a fee as a down payment for each vehicle.

The remainder would be paid on a loan repayment basis through the importing garage. Unfortunately, only about 12 vehicles entered the country, many members lost their money and people have been left feeling that they have been duped. Now operators have lost confidence in TPAZ although many are still following the rates set by TPAZ. Despite this the concept behind TPAZ deserves further consideration perhaps with some refinements.

Regulation and the provision of transport services

The trend towards liberalisation has been to reduce constraints for potential entrants into the sector and make the sector 'more responsive' to the market. Liberalisation does not necessarily entail the total abolition of regulations and controls but can help to harness competitive forces to provide effective and extensive market orientated services within a measure of "quantity" and "quality" controls.

'Quantity controls' entail limiting the number of vehicles and operators allowed to operate on routes and throughout the network so as to avoid excess passenger capacity. Without such constraints, it is argued that operators will tend to compete only on the most lucrative and heavily trafficked routes. On these routes this can lead to the wasteful duplication of services, congestion and excessive fuel consumption to the detriment of the national economy.

Many countries recognise that 'quality licensing' is also required even in a liberalised environment so that passengers are afforded a measure of safety protection. This is to prevent overloaded unroadworthy vehicles, often in a poor mechanical state, from transporting passengers. In addition licensing is a way to ensure that operators have adequate passenger insurance protection.

In contrast to the urban situation the main issue for rural public transport is how to increase service frequency. In most cases it seems unlikely that "quantity controls" would do much to alleviate this problem. The imposition of more stringent "quality licensing" may have an effect of improving vehicle safety however this could well be purchased at the expense of service frequency or higher fares. Union control over transport services does, to some extent, impose quantity controls because their activities restrict routes that vehicles can travel and artificially restrict supply on all routes by enforcing a policy of queuing for passengers/loads. The consequence of this policy is an infrequent but overloaded service that often prevents vehicles stopping along the way to pick up passengers.

Similar evidence is found in the market for freight transport. Overall it has been found that countries where freight transport were highly regulated with substantial entry controls, route licensing and price controls the average annual distance travelled was low (eg,. Korea, 33,000 km, Bolivia 45,000 km and Portugal 31,000 km). In contrast where freight transport services are not so regulated the average figures were much higher (eg,. Argentina, 91,000 km, Thailand, 53,000 km, Chile, 60,000 km, Paraguay, 70,000 km). However in Brazil (not regulated) the average was only 48,000 km (Guira, 1989).

Prohibition

Some transport authorities have prohibited certain types of intermediate means of transport. Sometimes it has been a matter of prestige. The authorities have banned these technologies because they are perceived to be backward and towns wished to present modern images. This was said to be the case with the banning of cycle rickshaws from Calcutta and Jakarta and the prohibition of animal transport and cycle rickshaws from Islamabad (ITDP, 1996). Arguments about modernisation and relevance were also used when horse taxis were banned from Addis Ababa and Bamako and also when donkeys were prohibited in parts of apartheid South Africa (Starkey, 1995).

It is quite common for non-motorised vehicles to be banned from major roads, such as motorways, with fast-moving traffic. Safety is given as the main reason, since there can be a risk of serious accidents when fast moving vehicles swerve to avoid slow-moving vehicles. It is to everyone's advantage if such prohibition is combined with special lanes or special routes

for carts and/or cycles. Unless such alternative options are provided, transport users will suffer.

In some cases, intermediate means of transport are not formally prohibited, but modern road designs have made it difficult to use them. Frequently local users of intermediate means of transport and slow moving vehicles experience difficulties after a road running through a village is 'improved' or 'upgraded' (for the benefit of inter-urban users). Common problems include steep road embankments, deep drainage channels and high steps or curbs between the new road and the surrounding land. Such obstacles make it very difficult for animal or human powered vehicles to pass.

Supply, distribution and maintenance systems

The low adoption of intermediate means of transport in remote rural areas is often related to problems of availability and supply. Clearly there is a 'chicken and egg' situation, with a vicious circle of low demand and low supply. There are many examples where the creation of improved supplies (of carts, axles, bicycles or donkeys) has stimulated demand and led to more rapid adoption.

In order to increase availability, it is necessary to identify the limiting factors. These may be components and raw materials (local or imported), manufacturing/assembling facilities and skills, designs of transport devices, capital availability and/or marketing systems. Each one of these may have to be addressed.

In some cases, shortage of supply can be overcome by training artisans or workshops to make the intermediate means of transport. In many cases, technical training is not enough. Technical training may need to be combined with credit and/or training in marketing, the management of small businesses and the establishment of stocks of raw materials.

In many cases, the problem of supply may be linked to the low purchasing power of the users (particularly women). Suppliers will not invest in manufacturing or stocks if they do not believe there is an economic market (as opposed to a felt need). Such situations may be over come through credit provision, income-generating schemes (eg,. labour-intensive road construction) or possibly subsidies.

Rural – urban linkages

Rural and urban transport are inextricably linked. Most medium and long distance rural movements are to urban areas. A high proportion of the motorised vehicles used in rural transport are owned, housed, and run from urban locations. The way that urban bus and truck parks are controlled and run have a profound effect on the nature of rural transport services. In much of West and Central Africa, and parts of the Middle East (eg, the Yemen) it is common for transport unions and cartels to maintain either formal or informal control of the urban and rural bus and truck parks in order to restrict competition and keep fares and tariffs high. Any attempt to tackle this problem would to done in conjunction with the urban authorities and take into account any implications for urban transport.

Sometimes urban controls can have adverse effects on the costs and efficiency of long distance and rural transport movements. Because of high parking/ loading and unloading charges within Phnom Penh in Cambodia some longer distance bus parks have been established well outside the city. As a result people pay extra to use motorcycles, and motor cycle trailers and other forms of transport (probably causing greater congestion as a result) to travel the 10 to 15 km from the city centre to get to the out-of-town bus park.

Promotion of rural transport technologies

Needs and justification

There is considerable evidence that the introduction of appropriate transport technologies into rural areas can alleviate poverty, reduce drudgery, increase production, trade, economic

activity and subsequent transport demand (see Starkey, 2000). The vicious circle of insufficient transport and inability to pay for it needs to be turned into a virtuous circle of improved mobility stimulating economic activity, social improvement, easier access and more efficient transport operations. This may require 'pump priming' interventions, including the promotion of particular transport technologies. These are likely to include local transport solutions (motorised or non-motorised) to enhance local productivity and complement the longer distance motorised rural transport services.

A recent review of successes and failures in the promotion of local transport solutions (Starkey, 2000) emphasised the importance of participatory processes in the planning, implementing and evaluation of promotional programmes. Promotion and subsidies had little long-term effect, unless the technology was appropriate to the environment, socio-economic conditions and perceptions of the users. Programme disappointments were often associated with the promotion of specific technologies (rather than a range of options) and/or the failure to distinguish between aspirations (attitudes) and realistic economic possibilities.

The rapid and 'spontaneous' adoption of transport technologies seen in parts of Africa, Asia and the Americas, suggests that active promotion by transport programmes is not always necessary. Nevertheless, the continuing problems of rural transport seen in other areas of Africa, Asia and the Americas suggests that technology promotion is an option that should be seriously considered by rural transport programmes. Even when transport technologies are being adopted 'spontaneously', promotion targeted at disadvantaged groups may be justified.

A holistic and inclusive approach is to transport technology promotion is required, so that all stakeholders are considered. While the transport end-users must be central to all planning processes, promotion may concentrate on the suppliers, support services, infrastructure requirements or service operators.

Programme focus and prioritisation

Programmes must undertake thorough 'market research' in order to understand the needs, wants, preferences, priorities and purchasing power of the diverse users in their target groups. Priorities should be set in terms of specific target groups (eg, disadvantaged rural women) and programmes based on the special requirements of such groups. A distinction should be made between access to transport devices and ownership, noting that access may be sufficient for some target groups. Once suitable technologies have been identified, promotional activities should be carefully targeted, in terms of area of intervention and beneficiaries.

With innovative technologies, there may well be a case for commencing work in areas/conditions where adoption is most likely. The idea would be to establish the technology firmly under favourable circumstances, before trying it in conditions where the physical, socio-economic and infrastructural environment may be less auspicious.

What constitute favourable conditions will depend on the technology. In many cases, favourable locations for transport operations are likely to include centres of trade and population, with high transport demand and income-generating prospects. In many circumstances, men are more likely to be the first adopters.

It may seem ironical to suggest that programmes trying to relieve rural poverty through transport might start by promoting the technology under relatively favourable conditions. Nevertheless, in some circumstances it may be a pragmatic early step. The combination of transport demand and support services around a local or regional market, should speed up adoption and help the creation of a critical mass. Once the technology has become well established, it should be much easier to introduce it into outlying villages, and to the more remote areas with greater need for poverty alleviation.

Credit and subsidies

Vehicle Purchase

Some of the lessons relating to credit are similar to the paradoxical lessons relating to promotion systems. There are many examples where credit provision appears to have been important in stimulating adoption. Examples include the introduction of animal-drawn carts in Guinea Bissau Senegal, Tanzania and Zambia. However, there have also been examples of animal-drawn carts being introduced in the absence of institutional credit. Examples include Ethiopia, Mauritania and Tanzania. There are also examples where credit was made available for the purchase of a particular technology, but this was not a sufficient incentive to lead to sustained sales and wide adoption. Examples include cycle trailers in Northern Ghana and wheeled toolcarrier schemes in Botswana, The Gambia, Mozambique and Uganda.

In Pakistan informal sources of credit play an important role in maintaining the efficiency of motorised transport services. Credit to buy vehicles is widely available from both extended family networks and from agents who also operate in the freight forwarding business. Credit is made available on a hire purchase basis and the owner of the vehicle is obliged to pay back a fixed sum of money per month. Although the effective financial rates of interest can vary widely (typically, for truck purchase ranging from 5 to 40% per annum) the average has been found to be about 20% (compared with an inflation rate of 8%) and the rate of default appears to be low.

It is clear that credit can be important in the adoption of new vehicle types, but it is not always essential. Sometimes, organisations have used credit to improve the access of users with fewer resources. Innovative credit schemes have enabled women with little cash to have for the first time direct ownership different forms of local transport solution. In the short term, credit may encourage some people to purchase and assess a technology. However, if a product is not popular, credit provision will not lead to sustained adoption.

Credit provision for specific technologies can distort markets. Users may opt for second preference technologies that are being promoted with credit, rather than purchasing their preferred technology. An example of this was seen in Guinea Bissau when initially ox carts qualified for credit but donkey carts did not.

The same general lessons apply to subsidies. Subsidies can help launch new types of vehicle in an area but they are not always necessary. If a product is unsuitable, high levels of subsidies may stimulate initial sales, but they cannot prevent rejection (eg,. the cycle trailer in Ghana). Subsidies tend to distort markets, and alternative products may be unfairly disadvantaged. Subsidies tend to be offered on expensive formal-sector and imported products, leading to unfair competition with cheaper informal sector and indigenous products.

Some indirect subsidies are widely used by private firms, public sector projects and NGOs. These are tooling up and training costs, large-scale production run assumptions and the provision of free product support. The vehicle producers do not (initially) try to recover product development costs. Early models, produced by expensive small-batch production techniques, are costed as if they were part of longer runs with materials/components obtained in bulk. In pilot marketing arrangements, distribution costs and the value of staff time and travel needed for early product support and promotion are not (initially) reflected in prices.

In rural sub-Saharan Africa, access to credit facilities for transport purposes is virtually non-existent from the formal, or even informal, banking sector. Where credit is available it is usually associated with targeted donor supported programmes. In these cases the credit is often subsidised, lent to co-operative groups and for a specific purpose such as the purchase of a tractor. The success of these programmes is limited because there is lack of individual responsibility and no penalty for default on the loan.

With regard to rural transport, this is a problem which is particularly relevant for the introduction of intermediate means of transport and tractor based technology. While there are

many agricultural credit programmes in rural areas, many do not lend for transport vehicles. Closer co-operation between agricultural and transport agencies in this regard could allow resources from the transport sector to be 'piggy backed' onto existing agricultural credit programmes. This would have a number of advantages including a better understanding of potential demand for particular vehicle types, greater access to funds and the reduced targeting of funds. A good model is the Bank of Agriculture and Co-operatives in Thailand which lends for a variety of agricultural/transport machinery. This concept could be expanded to include bicycles and animal carts.

Whether poor access to credit facilities is such a constraint to the greater availability of more conventional vehicles seems more doubtful as there is evidence of over supply of these vehicles in other parts of the transport system. The challenge in this context is persuading the owners of these vehicles to operate in rural areas. Urban based businessmen do not have the same financial constraints to the purchase of vehicles as their rural neighbours and if they can see a good business opportunity they will probably get access to funds.

Service provision

There is a need to explore the best way of ensuring that remote rural areas of developing countries have a minimum provision of transport services. Better rural infrastructure, although important, is an insufficient inducement. There are many examples (eg, rural Malawi, Zambia and Mozambique) where rural communities have reasonable road connections but the nearest commercial transport service will be at a road junction sometimes up to 50 km away. Specific inducements including operating subsidies are a common solution in high-income countries. Other solutions may include help to establish services based on new vehicle types. Bicycle, rickshaw and motorcycle stations are common in both urban and rural areas of many Asian countries for the shorter distance movements. Agricultural tractors and trailers, power tillers adapted for transport purposes or motorcycles with side cars could all be used to carry heavier loads on relatively long routes that have a lower density of demand. New forms of transport operating from different terminals could be very useful in establishing a new dimension of competition. Different vehicle types have different characteristics and would require different fare structures.

To increase service frequency and provide services to the remoter locations on social ground the routes could be licensed and operators could be required to run services to a timetable. This would often mean leaving the bus terminus before the vehicle is full. If this happened there would be greater chance of passengers being able to board transport someway along the length of the route. As is mentioned above for many of the more remote rural routes there would be a need to subsidise or cross-subsidise the operation to provide a minimum service on social grounds. This is very common for high-income countries.

The government control (or authorisation) of fare and truck tariff levels can play some part in helping to keep down prices. However this does need to be treated carefully; posted fare levels have also been used as a way to collectively prevent operators from accepting lower fares levels.

Lower fares and tariffs and greater trip frequency would help to encourage an expansion of the market. If rural communities were more certain of a regular service then they would in time plan their affairs (in terms of crop marketing, job seeking etc) to take advantage of the new situation.

One solution for thin transport passenger markets is to licence a number of routes together and require operators to competitively '*bid for the market'*. Route frequencies, fare levels and the amount of any required subsidy would be made explicit in the bidding and negotiating process. Groups of existing operators could be encouraged to form companies to place bids. Bidding for routes is used in high income countries and may be appropriate for certain operations within developing countries. Different operators can compete to supply the

service, in terms of the minimum subsidy they would need to operate the route (ie, there is competition '*for the market')***.** So where direct competition is not possible efficiency can be increased through a contract to supply the service. Competition occurs before the contract is signed and when the contract is up for renewal. The procedure provides an alternative to detailed regulation.

One drawback of the approach is that is that once the bid is accepted and the service in place further competition may be curtailed. This does, of course, depend on the nature of the contract with government. Furthermore bidding 'for the market' may imply an element of cross subsidisation between routes. In order to guarantee that the operator will run on the routes with low demand there may be a requirement for some protection from competition on the profitable high demand routes. In rural locations this may be difficult to enforce.

In high income countries a variety of transport subsidies have been employed countries as a means of ensuring passenger transport services at reasonable fares. In the past the UK government has employed fuel subsidies for buses and bus grants (provided on rural travel distance basis) for rural routes while specific route subsidies have been provided by the Local Authorities**.**

Within developing countries most transport subsidies have not been explicitly aimed down. These have largely been designed to protect (the richer) urban population from price inflation. Because rural transport is more informal, and is very largely supplied by the private sector, rural transport operators have not received direct operating subsidies to the same extent as their urban counterparts.

It has been argued that subsidising services does not always reach those people most in need of help with transport costs. The major beneficiaries are usually the richer sections of the population that travel most. Although this is unlikely to be a problem when subsidising specific services to the remote rural population it can be an important consideration when blanket subsidies are provided to a network of suburban and rural routes.

Travel passes and travel token schemes can be used to directly target specific groups and they can be adjusted to suit local conditions. For example travel passes can be issued to allow for free fare, half fare etc and like tokens they can be distributed according to specified criteria. In the UK travel tokens and passes have long used to aid the mobility of the elderly with schemes varying from county to county. Like all subsidies schemes tokens and passes may be subject to abuse. For example, the most likely abuse is that the token will be sold on to others and not be used for those it was intended. Even if this happens the original recipients will be major beneficiaries of the schemes.

In the current environment it is unlikely that subsidies will play a large universal role in rural transport provision however they should be examined carefully particularly a solution to providing transport to the most remote locations where there may be no regular transport service provided. Or where service frequency is measured in weeks or months.

Monitoring and evaluation

Self-critical monitoring and objective evaluation are fundamental to the success of any programme to develop and/or promote the use of transport operations. In the past, there has been clear evidence of enthusiasm for particular technologies running into 'hobbyism', lack of objectivity and irrational optimism in the face of disappointing adoption patterns (Starkey, 2000). Such problems may be overcome through mechanisms that include potential users (of different genders, status, purchasing power, etc) and other interested parties in programme planning, monitoring and evaluation procedures. Methods need to be developed to enable programme staff to understand the viewpoint of the diverse users. The various stakeholders must be allowed to talk honestly about their needs and concerns and realistically about their willingness to buy or use certain technologies. This 'attitude' information needs to be

regularly crosschecked with objective information from actual sales and use patterns, and any discrepancies investigated at an early stage.

Regular objective evaluation is also vital. Many programmes and individuals fear the potential for criticism that may come with external evaluations. Sympathetic evaluators are often selected. This may be more comfortable in the short term, but restricts the potential for learning and programme changes. Self-evaluation, aided by an independent external person, can be useful and may involve both programme staff and key/representative stakeholders. If someone from a transport project in another country assists the evaluation, the learning process may benefit two programmes simultaneously.

The lessons from evaluations should be documented and widely shared. Many of the positive and negative rural transport lessons highlighted in this and other papers have been identified through the circulation or publication of evaluation reports. More lessons could be learned more quickly, if there were more open and rigorous evaluations. The sharing of both successes and failures is an important networking function that speeds up learning and progress for all concerned.

Networking and information exchange

Rural transport programmes should promote and facilitate active networking and information exchange between the many concerned stakeholders. This should enhance programme relevance and efficiency. Collaboration may be stimulated through the formation of local formal or informal networks (transport forums, national or provincial steering committees). These link people who would not otherwise by linked, and bring them into the processes of planning, implementation, monitoring and evaluation. This local collaboration is most effective when combined with complementary international networking and information exchange.

Most of the lessons being highlighted in this paper have been shared as a result of international networking and information exchange. Strong formal and informal inter-institutional links have existed between a number of organisations concerned with rural transport, including international networks (eg, IFRTD), donor agencies (eg, ILO, World Bank) and consultancy firms (eg, IT Transport and TRL). This has resulted in valuable knowledge sharing and synergetic programme development. Such links should continue, but with greater emphasis on including more and varied partners (there has been a tendency for ‘northern’, Anglophone experience to be disproportionately high relative to ‘southern’, Hispanic and Francophone sources).

International networking, particularly south-south inter-programme linkages, allow transport programmes, and their constituent stakeholders, to learn of alternative options for rural transport services and technologies. They can also learn of effective (and ineffective) policies, strategies, techniques and methods. Passive information exchange through publications and webpages can be very valuable for making people aware of the technical and methodological options. However, interactive exchanges, through correspondence, visits and workshops, are even more important. These are much more likely to lead to the frank and critical exchange of ideas that are vital for learning, programme improvement and effective policy development.

PART 3 Conclusions and recommendations

Assess the existing transport situation and conditions

Involve all stakeholders

There is need for an integrated approach to the promotion and development of the rural transport sector, and one that involves all the stakeholders in inclusive, participatory processes. Transport planners must involve the major institutional stakeholders, in the public and private sectors (national government, local government, transport agencies, funding institutions, training organisations, etc). They should also include the representatives of the transport service suppliers (freight and passenger, large and small scale, formal and informal) as well as support services (manufacturers, importers, retailers, maintenance services, artisans, etc), transport infrastructure contractors (large and small), professional unions and associations, and relevant non- governmental organisations.

Transport planners must try to involve the transport users in appropriate ways during the planning processes. They must try to understand their different perspectives that vary according to gender, income, occupation, age and ethnic background. Participatory techniques (eg, focus groups, discussions) assist development planners to predict the transport needs, preferences, priorities and purchasing power of women and men, children and old people. Irrespective of economic logic, adoption and use patterns can be influenced by social status, prestige and aesthetics. Attitudes evolve and perspectives change.

Stakeholders should be involved in identifying, planning, testing, monitoring and evaluating transport technologies and services. Even if transport planners and programmes adopt holistic approaches and use participative methodologies, they cannot be sure of rapid success in rural communities, due to the very complex problems experienced by impoverished and marginalised people.

Conditions influencing the development of rural transport services

International patterns of rural transport services and the adoption of particular technologies are varied and paradoxical. Some technologies spread rapidly, others slowly and some are never adopted. Within countries, the adoption and use of transport technologies is not homogenous: there are clusters of particular types of transport operations.

The uneven distribution of transport services is partly explained by differences in population density, incomes, cultures, topography, climate, farming systems, transport needs and project activities. Other influences are more random or ‘chaotic’, depending on human inventiveness, entrepreneurial skills, personal preferences, fashions and ‘chance’. Complex combinations of environmental and socio-economic factors and fickle human reactions make the use of different transport technologies unpredictable.

Profitability is a key factor in the development of rural transport services and the adoption of local transport solutions. Most transport devices generate income, save time or assist profitable ventures. Concentrations of transport services exist in urban areas and near markets, where there are profitable transport activities, production and repair facilities and raw materials. Development of transport technologies and services is assisted by urban trade patterns, information flows, cultural diversity and year-round economic activity. Where transport demand is high, different technologies coexist, fulfilling specialised niches. Processes of innovation, assessment and adoption are rapid. A ‘critical mass’ of mutually-reliant users and support services develops.

While economic factors are crucial to overall transport efficiency and profitability, there are also important social concerns to consider. Even if rural transport systems reduce drudgery and stimulate the overall economic development of communities, the benefits will not be shared equally. The more marginalised members of society may even be impoverished

(relatively or absolutely) by the entrepreneurial activities of richer people able to afford transport technologies. Women, the elderly and people with special needs are unlikely to benefit proportionally.

Among the key factors that influence whether rural transport services are efficient and effective are:

- Level of economic demand for transport (relating to opportunities for production, marketing, employment, etc and household budgets)
- Cost of transport technologies and all operating inputs
- Competitive transport markets
- Critical mass of users and service providers and support services
- Quality of infrastructure
- Availability of a range of appropriate and affordable transport technologies
- Appropriate policy and fiscal and regulatory environment
- Impact of culture and gender relations on demand and use patterns.

Planners and task managers endeavouring to improve rural transport services should assess these (and other) factors with the various stakeholders. They should identify the key limiting factor(s). They should also define which of efficiency-reducing elements can altered at an acceptable cost and in a realistic timeframe.

Contrasting rural transport situations

This paper has attempted to examine the nature of rural transport around the world. It has identified many and varied forms of rural transport and provided evidence to suggest that there are interventions that can be taken which can dramatically increase the mobility of rural people. It is clear that solutions will depend on the local situation, and will differ between countries and even between provinces or districts within countries. Issues such as density of demand, income levels, infrastructure provision, regulatory framework and culture all have a significant impact on the level, price and type of transport technologies used and services provided.

The challenge here is to identify the types of interventions that can be undertaken by different stakeholders and to suggest the situations in which they are most likely to be appropriate. The analysis will be aided by examining contrasting characteristics of rural travel and transport situations around the world. While recognising that there is a continuum of conditions, Table 5 presents three contrasting rural transport scenarios. The first two columns illustrate two extreme positions of poor rural areas, with ‘low density’ and ‘high density’ of rural transport. The last column (which will not be discussed in detail here) relates to rural transport in more affluent countries, or areas, and has been included to illustrate the similarities and differences.

This table can be linked to the five-category model of income-based transport demand presented in Section One of this document. The first column corresponds to the ‘extremely poor’ and ‘very poor’ categories of this income model. These have been treated together as ‘low-density’ transport situations. The second column corresponds to the ‘poor’ and ‘the better off’ categories of the income model, which together illustrate relatively ‘high density’ transport situations.

It is not the contention here that the characteristics of rural transport can be split into discrete groups but it does provide a useful framework for analysing the types of interventions that are most likely to be effective. Many real life scenarios will have characteristics of both the low and high density situations presented here. There will have to be an element of mixing and matching to find ideal combinations of interventions for each unique situation. There is no universal solution.

Table 5: Three contrasting rural transport situations

Note: This highly simplified table is designed to illustrate simply some contrasting features of rural transport services.
In reality there is a continuum of conditions. Different areas and situations have their unique characteristics that cannot be directly compared.

	Low density of transport in low income areas *(Relatively 'unfavourable' conditions)*	**Higher density of transport in low income areas** *(Relatively 'favourable' conditions)*	**Low to medium density of transport in high-income rural areas** *(High income comparison)*
Population and income characteristics	Low to medium rural population density. Land plentiful, but not necessarily fertile. Much agriculture involving traditional subsistence crops. Little non-agricultural employment and generally low incomes.	Medium to high rural population density. Little available land. Agriculture involves basic food and cash crops, possibly with irrigation. Diverse rural services serving population and some non-agriculture income.	Low to medium rural population density with strong urban-rural connections. Mainly market-based, mechanised agriculture, with many external inputs. High incomes, including non-agricultural income.
Transport characteristics	Poor transport infrastructure Low vehicle ownership Low diversity of transport technologies Intermediate means of transport expensive Transport services infrequent and high cost Transport for 'domestic' tasks (water and fire wood) often lacking	Adequate transport infrastructure Medium to high ownership of intermediate means of transport, including motorcycles High diversity of transport technologies Intermediate means of transport quite cheap Transport services quite available and of low to medium cost Intermediate means of transport may be used for 'domestic' tasks (water/firewood)	Good transport infrastructure Moderate to high levels of ownership of motorised vehicles and/or intermediate means of transport High diversity of transport technologies Transport services quite available in areas of high population. Cost of rural transport variable, and highly dependant on demand Families seldom need transport devices for water or fuel
Areas where applicable	Most rural areas in sub-Saharan Africa. Remote rural areas in Asia (eg, Laos, NW Vietnam, NE Cambodia, Mongolia) Remote rural areas in Latin America (eg, Bolivia, northern Peru) Mountainous areas in many parts of the world.	Most peri-urban areas in sub-Saharan Africa. North Africa Fertile rural areas in South and Southeast Asia Peri-urban areas in the poorer Latin American and Asian countries.	Peri-urban areas in the richer Latin American and Asian countries. Most rural areas of Europe and North America

Examples of specific problems	Isolation from essential social and economic services and marketing options Overcrowding and poor safety Most people lack transport and are isolated due to infrequent and relatively unaffordable transport services Unviable transport operations due to high costs and low economic demand Lack of competition and a regulatory framework in the transport sector Unavailable and/or unaffordable local transport solutions Low use of intermediate means of transport, particularly by women Lack of rural transport strategy and support	Overcrowding and poor safety High pollution Poor legal framework and enforcement Intermediate means of transport not included in the organisational framework Lack of transport coordination and structure Users of intermediate means of transport marginalised by other vehicles Disadvantaged people (elderly, disabled, unemployed) may find transport unsuitable and/or unaffordable Lack of rural transport strategy and support	Rural transport services unviable due to dispersed population and/or high use of private vehicles. Disadvantaged people (elderly, disabled, unemployed) lack transport and are isolated due to infrequent and relatively high cost transport services Users of intermediate means of transport marginalised by other vehicles Lack of rural transport strategy and support
Examples of possible interventions to be considered by transport professionals	Inclusive, participative planning and management techniques involving all stakeholders Subsidies (rural funds) Fundamental reform of transport services sector (strategies, liberalisation, taxes and duties), public-private partnerships, competitive tenders for routes and/or areas. Promotion and financial support/credit for production and/or purchase of intermediate means of transport. Training in the whole sector, including vehicle maintenance Route planning Road spot improvements Combi transport (goods and passengers)	Inclusive, participative planning and management techniques involving all stakeholders Special routes/lanes for slow-moving vehicles (eg, cycles, animal carts) Improve safety, environment and transport efficiency through better coordination of relevant stakeholders, suitable legal framework and enforcement of regulations Training in the whole sector, including vehicle maintenance	Inclusive, participative planning and management techniques involving all stakeholders Subsidies for rural transport services Transport telematics Improved information systems Combi transport (goods and passengers)

Characteristics of 'low density of demand' situations

The first two cases in Table 5 are typical of many rural areas in sub-Saharan Africa as well as many relatively 'remote' areas of Latin America and Asia. Such 'remoteness' need not imply great distances: such conditions can exist just 100 kilometres from capital cities in Africa, Asia and Latin America. Comparable conditions exist in mountainous areas in many parts of the world.

These 'low density of demand' situations are generally characterised by low human population densities, very low income levels and low densities of transport systems (few motorised vehicles, few intermediate means of transport). Much rural transport involves walking and carrying. The areas depend mainly on agriculture, dominated by traditional food crops and/or extensive livestock systems. Outside the agricultural sector, there is little paid employment, and marketing systems are often localised and small-scale.

These areas generally have poor transport infrastructure lacking developed local networks and reliable all-season access. Ownership of motor vehicles is generally low, and there is a low diversity of transport technologies. Intermediate means of transport (bicycles, animal-carts) may be rare and/or expensive. Women seldom have access to local transport solutions. Passenger and freight services are often combined, but are infrequent, expensive (unaffordable to many), overcrowded and with a poor safety record. Motor transport operations are barely viable, due to high costs and low economic demand. There is little competition between transport services. Although there may be security checkpoints along roads, effective regulation is generally minimal.

In such situations, processes of innovation and adoption can be slow, affected by low economic activity, low availability of key materials, limited information exchange and high seasonality of cash flows and transport demand. There is no 'critical mass' of transport services. It is difficult to buy, use and maintain transport technologies when they are rare and supporting infrastructure for their manufacture, supply and repair is scarce. A vicious circle hinders development, with insufficient support services for easy adoption and insufficient users to sustain sales and maintenance services.

When transport technologies are adopted, they tend to be relatively unspecialised designs, so they can be used for many different transport tasks. The cost of vehicle ownership is often spread through hire systems.

Characteristics of 'high density of demand' situations

While continuing to recognise the continuum of actual conditions, it is helpful to contrast the 'low density of demand' scenario with a 'high density of demand' one. High density of demand rural transport situations, as shown in the second scenario in Table 5, tend to be associated with peri-urban areas, and are most obvious around markets. In Africa, relatively high density transport can be seen in most peri-urban areas, and in fertile areas with high populations (close to rivers, in 'rice-bowls' and 'groundnut basins') and high incomes. Much of North Africa and the Nile valley exhibits such characteristics, as do many fertile rural areas in South and Southeast Asia. In Latin America, such concentration are again mainly visible in the peri-urban areas, and places with fertile soils and/or significant employment options.

These high density of demand situations are generally in areas with medium to high rural populations, where there is little available land and/or where incomes are higher. Agriculture, which may well involve irrigation, involves significant 'cash crop' elements, with marketing systems established. There are many different rural services (local workshops, suppliers, traders) and non-agriculture income is quite important (trading, processing, manufacturing, services, etc). Overall, cash flows and transport demand fluctuate, but not with extreme seasonality.

These areas tend to have adequate transport infrastructure (not good but better than the remoter areas). Transport services (which are mainly in the private sector) have achieved a

'critical mass' and it is quite easy to buy, repair and maintain a wide range of motorised and non-motorised transport devices. Processes of innovation and adoption can be rapid, affected by relatively high economic activity, availability of key materials and rapid information exchange. Intermediate means of transport (including bicycles, motorcycles and animal carts) are widespread and relatively affordable. There is a high diversity of transport technologies, motorised and non-motorised. Motorised transport services (pick-ups, mini-buses, buses and lorries) are quite available and of low to medium cost. Conventional transport technologies (including vans and cycle technologies) may be modified for special purposes.

The transport situation seems quite efficient and stable, but there are significant problems. Vehicles are frequently overcrowded and overloaded, and the safety record is poor. The situation may appear anarchic, with little transport coordination, no clear legal framework and/or enforcement systems. There may be road congestion and/or pollution. Intermediate means of transport are seldom included in any planning or organisational framework, and they tend to be marginalised by larger road vehicles. Users of four-wheel (and above) motorised vehicles become frustrated by smaller vehicles and endeavour to have them prohibited.

Possible interventions

A range of complementary options and methodologies can be considered to improve the efficiency, effectiveness and equitability of rural transport. Certain interventions are appropriate in most circumstances, while others are more appropriate in 'low-density' or 'high density' situations.
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Participative planning processes and empowerment

Dialogue and inclusion

In all situations, there is a requirement for inclusive, participative techniques involving all stakeholders to develop appropriate rural transport strategies, plans and actions. Many of the stakeholders that may be implicated are shown in Figure 2. These include ministries, local government, NGOs, financial and training institutions, transport operators, suppliers as well as the users and potential users.

Define needs

It is necessary to understand and clearly define the transport needs, wants, preferences, priorities and purchasing power of rural people, who should be the main beneficiaries of rural transport initiatives. Since the more powerful rural people, with their own transport agendas, are likely to be most vocal and articulate, inclusive techniques will be required to empower the less powerful rural people to participate. These may include women, children, the very poor, the elderly and the infirm. In line with prevailing policies of governments and donors, poverty reduction criteria should be implicated in the needs assessments. The principles and practices of Sustainable Livelihoods Framework Analysis may be helpful.

Plan holistically

Strategies should address the total picture of a transport system looking at infrastructure and mobility as an integrated solution. A cross-sectoral approach is needed involving several ministries. The roads and the transport devices need to complement each other if transport objectives are to be fulfilled. An equitable strategy should also incorporate a gender analysis and consider issues relating disadvantaged groups such as the extremely poor, elderly and disabled. The principles and practices of Integrated Rural Accessibility Planning (IRAP) may be helpful.

Educate planners

Many of the issues raised in this paper require planning both at the local and national levels. Participatory approaches, gender analysis, route licensing, regulation and other issues are complex and require training. Training institutes, universities and technology transfer centres

have to prepare the planners of the future. Changes in prevailing attitudes are also required (eg, greater use of intermediate means of transport) and this is best achieved during the formative stages of people's careers. The need is not simply for transport engineers but a cadre of broadly-trained transport professionals.

Monitor and evaluate
There is need to encourage stakeholder-involvement in self-critical monitoring and objective evaluation of all rural transport initiatives. Results should be analysed and widely shared.

Consider disadvantaged groups
It should be implicit in the holistic, inclusive approach that disadvantaged groups are considered. However, in the pursuit of the efficiency and profitability of rural transport systems, there is always a tendency to concentrate on the more numerous, affluent, influential and vocal groups. In the interests of poverty reduction and equity, it is necessary to actively consider the needs of the disadvantaged, whether this is due to gender, age, disability, poverty, ethnicity or other factors. Specific, targeted interventions may be required, including alternative technology options, subsidies, credit and the formation of self-help empowerment groups.

Develop policy and create awareness

Sensitisation and political support
Most politicians, transport operators, transport planners and rural communities assume infrastructure improvements will lead to improved rural transport. This is partly true, but not the whole story. There are large differences in the costs of motorised and non-motorised transport that cannot be explained by infrastructure provision alone. Pertinent factors may include the policy and fiscal environment, supply systems, competition, promotion, regulation, market arrangements and demand patterns. A process of investigation and sensitisation is required to explain these differences and identify the interventions that can be undertaken. Support from national and local political leaders is essential but often difficult. Possible activities include the sensitising stakeholders of the issues through the media, workshops, reports, study visits and networking exchanges. Local user groups may lobby politicians.

Create an enabling environment
Develop policies at national and local level that facilitate and stimulate the development of a wide range of complementary transport technologies. The policies may involve many elements including fiscal, legal and educational aspects. The enabling environment should prevent the unilateral prohibition of particular technologies which communities perceive as important.

Encourage local transport solutions
Policy makers, politicians and local communities need to be made aware of the complementary nature of transport technologies. In particular, the value of intermediate means of transport for short-distance travel should be stressed.

Improve the image of non-motorised transport options
People (particularly the young) often perceive non-motorised transport as 'old-fashioned'. This damaging view also exists among politicians and within development agencies. Human and animal power will always have appropriate and valuable transport applications, and their modern relevance must be acknowledged and promoted. Positive images showing the value of transport solutions to present and future development should be included in schoolbooks, media programmes and documentaries and development reports. Targeted campaigns should help raise awareness.

Encourage gender awareness in the transport sector

There is need for greater awareness of the gender inequalities in rural transport, and ways these can be addressed. Women generally have less access to transport technologies, information, credit, cash incomes and profitable transport activities. Their viewpoints are less heard. Men determine most transport interventions. Gender relations in societies may make it difficult for women to benefit from certain rural transport technologies and services. Transport-related initiatives should incorporate gender analysis, involve women and address gender imbalances in transport and ensure transport technologies and services are suited to women's needs. Awareness of the issues should be created through the media, publications, workshops and networking activities.

Undertake participative research

This paper has highlighted the need for greater understanding of how to improve the efficiency, effectiveness and equitability of rural transport systems. Further understanding needs to be gained and shared relating to the technical, economic and social aspects of transport technologies, transport services and the transport problems and perceptions of the stakeholders.

Share information

Active networking at national, regional and international levels allows the sharing of lessons and ideas. This should lead to greater understanding at all levels of factors influencing the use, efficiency, social value and economic benefits of rural transport technologies and services. Rural transport programmes should be the subjects of critical monitoring by independent observers to measure impact for all stakeholders and ensure sustainability.

Encourage the diversity of vehicles and transport technologies

Promote the diversity of vehicle types

Efficient rural transport systems need a diversity of vehicle types. Often, local transport solutions are appropriate for farm to village, within-village and village to market transport. Larger motorised vehicles are often suitable for the longer higher demand routes. It is inefficient to use intermediate means of transport on long distance, high demand routes and to use large motorised vehicles on short distance, low demand routes. All vehicles types need to be accommodated in national and local transport planning. A diversity of transport options should be encouraged.

Promote alternatives

The past neglect of intermediate means of transport makes it necessary, in many situations, to promote local transport solutions to policy makers, politicians and local communities. The sensitisation process should introduce options rather than promoting particular technologies. Where possible the promotion of particular technologies should be left to the private sector.

Assist critical mass

In 'low density' situations, it is particularly important to assist the achievement of 'critical mass' of local transport solutions. If a transport technology is to be viable, there is a need for a 'critical mass' of users. This means sufficient users to make potential adopters comfortable with the technology and to justify support services (manufacture, sales, repairs). Strategies designed to achieve a 'critical mass' may involve a variety of promotional techniques. There may be demonstrations, field days, training, media coverage, advertising and other forms of publicity. The provision of credit to manufacturers, retailers and/or purchasers may prove very effective. Promotion may also include some form of direct or indirect subsidy. Stimulating viable support services around markets with economic activities may encourage a local critical mass of transport technologies.

Ensure credit facilities
Credit for transport operators, traders, manufacturers or importers can stimulate greater use and adoption of transport technologies. Credit is particularly important for facilitating the production and purchase of intermediate means of transport. Credit programmes should consider the specific needs of women.

Improve economic conditions and cash flows and stimulate local initiatives

Stimulate employment options
Transport and economic activity are often closely linked: one stimulates the other. The most intense and diverse transport operations are associated with markets and income-generating options. One way of improving transport services is to stimulate economic activity. Provision of employment options (eg, labour based road construction and maintenance) may assist the adoption of local transport solutions. Promoting the establishment of transport hire services can also stimulate adoption. These interventions are particularly important in 'low density' situations.

Improve marketing options
Improving rural marketing opportunities can lead to higher rural incomes, making it easier for people to afford their own local transport solutions, or pay for transport services. In low density situations, stimulating the marketing of 'cash crops' (including basic grains) or animal products can stimulate transport demand, supply and profitability. Improving the supply of limiting factors, such as fertiliser, can also help.

Support small-scale enterprises
Individuals or small groups can be supported to set up transport service operations. The support may include credit and training in operation, maintenance and enterprise management. Depending on the initiative, other training may include driving motor vehicles or providing health care to donkeys. Programmes specifically targeted at supporting women transport operators have proved successful.

Promote regulatory reform, increasing competition and demand management

Support reform of transport associations
In many countries, particularly in 'high density' transport situations, transport associations, unions or syndicates have certain monopoly powers. They cite the dangers of exploitation in uncontrolled markets and claim to safeguard the interests of members and transport users by ensuring good services at reasonable prices. Nevertheless, evidence suggests that transport users benefit from increased competition that leads to an improved and more frequent service at a lower price. Methods for encouraging reform include:

- Sensitisation of the issues (workshops, publications, media, study visits, networking)
- Demonstration that revenues, employment and overall transport market are likely to increase not decrease with greater competition
- Mobilisation of local user groups to lobby for better standards
- Provision of support to management, driver training and maintenance
- Consideration of incentives including infrastructure provision, safety campaigns and subsidies
- Government legislation to prohibit restrictive practices
- Buying out excess capacity where necessary

Improve demand management
There are five main ways in which interventions from either the public or private sector can maximise the effective demand for commercially run transport services:

- Provision of rural markets, depots and terminals to minimise route distances for both larger vehicles.

- Promote the use of intermediate means of transport to facilitate the amalgamation and dispersal of goods to and from larger vehicles.
- Improve the interconnectivity of infrastructure to reduce the need for operators to travel on there and back routes.
- Transport brokers can help to match passengers and goods with available vehicles. Requires communications but could be particularly helpful in low density areas.
- Improved information flows via radio or other communications media can help in making journeys more profitable. Market price information could influence trips to markets.

Enhance human capacity

Train for enterprise management

Private transport operators and transport companies need the management tools available to them to operate as sustainable businesses. This is equally true of operating large trucks and buses as it is with 'bush taxis' and intermediate means of transport. Viable enterprises and credible competition are required to counter monopolistic transport associations.

Train transport operators, drivers and support personnel

Improved driver training has the scope for reducing operating costs, increasing passenger comfort and dramatically improving passenger and pedestrian safety. Training mechanics and support services can also have major benefits.

Train for welfare

Transport animals remain extremely important for rural transport, and their use is increasing in many parts of the world. In all areas, but particularly in areas of expansion, there is need for training relating to the animal health, husbandry and management.

Improve inputs and supplies

International vehicle, component and spare part sourcing agency

Vehicles (from bicycles to freight trucks) and spare parts have differences prices and specifications around the world. These differences have a significant impact on operating costs and transport charges. There is scope for agencies or companies to source appropriate vehicles and/or components outside of their own countries. Such agencies may help combat the exclusive dealerships of motorised vehicles found in some countries. They could lead to major savings in the price of local transport solutions, such as bicycles, where mass-produced products are available for a fraction of the price that that a fledgling local industry could achieve. Decentralised, local assembly from cheap, imported components may be an alternative option.

Local manufacture

In certain conditions, it may be appropriate to support the development of local industries for the manufacture of vehicles and spare parts. The resulting combination of cost and quality, compared with other options, will be crucial as operators and users are sensitive to these. Depending on the technology (from hand carts to motor vehicles) these initiatives may be centralised or decentralised or a combination of both. For some technologies (including ox carts and basic agricultural vehicles), the combination of centralised production of precision parts (cart axles, motors) and the decentralised manufacture of bulky bodies, is appropriate.

Improved rural supply

In 'low density' rural areas, improving the local supply of local transport solutions (including carts, cart axles, bicycles or donkeys) can assist adoption. Improved supply can stimulate demand and lead to more rapid adoption. In order to increase availability, it is necessary to identify the limiting factors. These may be components and raw materials (local or imported), manufacturing/assembling facilities, workshop skills, designs of transport devices,

capital/credit availability and/or marketing systems. Each one of these may have to be addressed.

Support to vehicle backup services
To minimise vehicle downtime it is important that operators have access to the necessary spare parts and mechanic services. This is true for all technologies, from large-scale motor vehicles to ox carts and bicycles. Interventions include training, local manufacture of spares, support with sourcing spares and assisting the establishment of depots and distribution systems.

Improve infrastructure and traffic management

Provide structures
The provision of appropriate structures (bridges, culverts, drifts, etc) on rural roads, tracks and paths is probably the most important component of infrastructure provision. Without these structures vehicles do not travel and choice of local transport solutions is severely restricted.

Maintain road and apply standards
Spot improvement techniques should be widely adopted. Where full upgrade is reasonable then 3-3.5 metre standards are appropriate for rural feeder roads (eg, village to market).

Upgrade paths and tracks
Conventional infrastructure projects should include upgrades to paths and tracks and local bridges to facilitate the movement of local transport devices. This facilitates household and village level transport, and provides supply and distribution systems for motorised transport services.

Urban terminals for rural transport services
Transport companies need access to terminals in urban areas from which to conduct their rural transport business. Such transport terminals are an essential component of a rural transport system. Political and governmental support is needed to grant permission. Local government or outside investment is required, perhaps in conjunction with market facilities.

Ensure infrastructure is appropriate for all users
There has been a tendency for transport planners to design and construct roads and bridges thinking only of long-distance motorised transport. Non-motorised transport may then be marginalised or even prohibited from using essential infrastructure (eg, tricycles on bridges, ox carts on rural roads). Communities should be consulted on the important types of non-motorised rural transport operating in an area, so that the infrastructure designed/modified appropriately, with special lanes for slow-moving vehicles if necessary.

Consider targeted subsidies

Justification
Subsidies can take many forms including lowering the cost of intermediate means of transport, direct subsidies for rural transport service routes and indirect subsidies such as reduced duties on transport devices, spare parts and fuel. Governments, in consultation with rural communities, should set minimum access and mobility standards for both motorised transport services and local transport solutions. For example a minimum standard for one area might be two motorised vehicles per week, one cart per ten households and one bicycle per five families. There may be a case for subsidies, if rural communities fall below the agreed standards. The potential social benefits of subsidies, as well as possible market distortions, should be clearly assessed.

Direct route subsidies
Route subsidies should only be considered when the transport industry is operating competitively. This makes it more likely that subsidies only go to routes that are not viable. Different transport operators should compete for the routes and the level of subsidy that is required to operate them. Where there are large-scale operators, they can be asked to compete for all routes in a particular area, allowing some cross subsidy between profitable and unprofitable routes.

Indirect subsidies
Indirect subsidy through the reduction of purchase price and/or operating costs of transport technologies can increase transport utilisation and improve service provision. Options include reduced import duties and/or taxes on transport technologies, components, spare parts and fuel. Subsidies linked to specific technologies distort choices and markets. Subsidies through formal tax and duty systems tend to benefit the formal sector and imported technologies, and may marginalise artisans and locally-made products.

Improve safety and promote a good environment

Vehicle inspection
Programmes of vehicle inspection that are adequately enforced will increase the roadworthiness of vehicles. Greater attention to brakes, lights and general vehicle care for motorised and non-motorised transport will increase safety for all road users. A combination of legislation, enforcement and education is required.

Driver training
Programmes of driver training will increase the profitability of the transport industry and also make roads safer for all passengers and pedestrians.

Traffic and safety engineering
Several interventions can improve safety, including special routes/lanes for slow-moving vehicles (eg, cycles, animal carts), traffic calming structures and crossing points for people, animals and slow vehicles. Roads should be designed to allow easy and visible access or crossing local transport solutions (carts, bicycles). These interventions are particularly important in 'high density situations'.

Enforcement
Safety is a particular problem in rural areas. People have few transport options and will accept high risk and low standards. Transport operators are often operating on low margins, and often use the cheapest, least roadworthy vehicles. Large motorised vehicles are often overloaded with both passengers and goods. Intermediate means of transport (human, animal and motor) often lack reliable brakes, lights and reflectors. Certain transport devices (including cycles, two wheel tractors, and animal carts) may not have statutory safety standards. It is difficult to enforce safety regulations and rigid imposition could reduce overall transport provision. Over-zealous enforcement could stifle innovative transport practices and price operators out of the market. Safety enforcement in rural areas, must be sensitive to the quantity and type of traffic and infrastructure, the need of communities for many transport options, as well as protection.

Environmental regulations
As with safety, there is delicate mix between economic, social and environmental issues in the development of transport regulations. The trend towards stricter environmental standards will require the replacement of old vehicles and/or the fitting of filters and particulate traps. This may lead to higher transport costs that will impact most on the poor. Relaxing regulations for rural areas could increase the supply of older, cheaper transport, but at an environmental cost.

It is important that there is adequate cross-sectoral co-ordination promoting an efficient and competitive transport industry.

Non-polluting options

In 'high density situations', increased attention and value should be given to non-polluting options, particularly for local transport solutions. Cycles, tricycles and animal-transport options provide valuable transport without environmental damage. These complementary technologies have often been neglected (and in some cases banned) due to their old-fashioned image. For small loads and short distances, these environmentally friendly options may be the technologies of choice.

Choice of interventions and methodologies

The appropriate strategies and interventions to adopt will depend on the particular circumstances, with no two situations being the same.

In low-density, 'unfavourable' situations, there are likely to be major problems (low density, low profitability, lack of critical mass, etc). There may be a need to intervene in some ways to break the vicious circle of low adoption and unaffordable services. Strategies to stimulate new transport initiatives may well include some active promotional interventions (eg, credit, subsidies, improved supplies) and/or initiatives to stimulate the rural economy through higher production, marketing and employment. Although regulation may be desirable, a relatively light approach is required, to allow transport capacity and utilisation to expand.

In the more favourable 'high density' situations, there is less need to stimulate and develop transport operations and services. Given the more favourable economic conditions, high density and high demand assumed in this case, a diversity of transport technologies and services is likely to be operating through 'spontaneous' private initiatives. Thus the favoured strategies are more likely to be aimed at facilitating and improving existing systems, with more emphasis on regulation, safety and the promotion of fair competition.

The envisaged greater attention to regulation, safety, welfare and special interest groups in the 'high density' situations should not imply these are not important considerations in all situations. They simply move up the list of priorities when transport systems are working effectively. In all situations, the potential impact of the various strategies on different groups of transport users and services has to be carefully considered.

While strategies will differ markedly, depending on the local circumstances, the appropriate methodologies should be very similar, based on participatory, gender-sensitive approaches and the inclusion of all stakeholders. Holistic approaches will be required, taking into account the complex and complementary interactions of infrastructure, policy environment, transport technologies, operating systems and variable human perceptions. Particular attention should be given elements that have been neglected in the past, including gender, the environment and the encouragement of local transport solutions (human, animal and motorised).

Public, private and/or NGO concerns and partnerships may devise and implement the suggested interventions. Success, measured in enhanced rural transport, poverty reduction and economic development, probably depend on stimulating numerous, local initiatives that are clearly appropriate to specific areas and particular stakeholders.

Checklist of the possible interventions suggested

Participative planning processes and empowerment
- Dialogue and inclusion
- Define needs
- Plan holistically
- Educate planners
- Monitor and evaluate
- Consider disadvantaged groups

Develop policy, create awareness and share information
- Sensitisation and political support
- Create an enabling environment
- Encourage local transport solutions
- Improve the image of non-motorised transport options
- Encourage gender awareness in the transport sector
- Undertake participative research

Encourage the diversity of vehicles and transport technologies
- Promote the diversity of vehicle types
- Promote alternatives
- Assist critical mass
- Ensure credit facilities

Improve economic conditions and cash flows and stimulate local initiatives
- Stimulate employment options
- Improve marketing options
- Support small-scale enterprises

Promote regulatory reform, increasing competition and demand management
- Support reform of transport associations
- Improve demand management

Enhance human capacity
- Train for enterprise management
- Train transport operators, drivers and support personnel
- Train for welfare

Improve inputs and supplies
- International vehicle, component and spare part sourcing agency
- Local manufacture
- Improved rural supply
- Support to vehicle backup services

Improve infrastructure and traffic management
- Provide structures
- Maintain road and apply standards
- Upgrade paths and tracks
- Ensure infrastructure is appropriate for all users
- Urban terminals for rural transport services

Consider targeted subsidies
- Justification
- Direct route subsidies
- Indirect subsidies

Improve safety and promote a good environment
- Vehicle inspection
- Driver training
- Traffic and safety engineering
- Enforcement
- Environmental regulations
- Non-polluting options

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Note: This reference list is based on the sources consulted for the two background studies. In the final version of this paper, the references not cited in this paper will be deleted and new references added.

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