Rural Transport and Accessibility

A Synthesis Paper

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Preface

Rural transport and accessibility problems cause isolation, which is one of the interlocking dimensions of poverty. Moving from this consideration, the ILO has been promoting for several years now initiatives aiming at improving rural access to facilities, services and employment opportunities as an effective means towards poverty alleviation. Such initiatives have contributed to raise awareness about rural accessibility planning and its possible contribution to development goals such as employment and income generation, the empowerment of rural communities, a reduced burden on women and the protection of the environment.

The present paper brings together the results of four studies which were undertaken in the framework of an interregional project on rural transport and accessibility financed by the Swedish International Development Cooperation Agency (Sida) and managed by the Employment-Intensive Investment Branch (EMP/INVEST) of the ILO. The considerations emerging from these studies lead to a more general discussion on the issue of how to provide effective solutions to the access needs of rural populations. The paper reinforces support to the current trend towards a systems approach to the issue and describes the important aspects of the development of such an approach.

This paper is the first of a series of Rural Accessibility Technical Papers (RATPs) to be disseminated by EMP/INVEST for making information on rural accessibility and related research and practices easily available to interested organisations, institutions and individuals. We trust that these papers will contribute to enhancing national and local capabilities to plan for and implement accessibility improvement interventions which are of direct benefit to the rural poor.

Jean Majeres,
Head, Employment-Intensive Investment Branch.
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CHAPTER 1
INTRODUCTION

This volume brings together the results of a set of studies initiated by the ILO under their Rural Transport Programme which is funded by SiDA.

The studies were designed to respond to the need to assess rural transport in a more holistic fashion. Previous research work has suggested that there is huge diversity of transport demand in the rural areas of developing countries. Conventionally this demand has been met by providing road and vehicle solutions. Research work, much of it carried out by the ILO, has identified two major issues that need to be taken into account when addressing rural transport problems:

- transport in the rural areas relates principally to basic needs activities and is carried out mostly on foot or with the aid of intermediate means of transport
- many transport problems have their solution in non transport interventions such as the appropriate siting of services

With this in mind the ILO commissioned a series of studies and reports which would look at the four main aspects of rural transport, viz:

- Intermediate Means of Transport, a case study of the use of donkeys in Kenya
- The transport infrastructure available in the rural areas, a time series study of roads and the use of IMTs in India
- The use of transport services, a study of motor tricycles in the rural areas of the Philippines
- A study of rural transport patterns in Indonesia indicating the impact of location of services

These studies have their own unique reports. This document brings together the results of the four studies. However it goes a stage further in that it places the studies in the framework of the research that has been carried out over recent years on rural transport.

Rural transport is a subject that received scant attention from development specialists until the mid 1980s. Some work had been done by ILO and the ITDG in the early 1980s in an attempt to demonstrate both the variety and the extent of rural transport. Using the household as the unit of origin it had shown that transport was a major factor in the time budget of rural households. Given that transport is an unproductive activity and that much of the transport was for basic needs activities such as water and fuelwood collection, this evidence was significant. About the same time it had become clear that conventional approaches to developing rural transport, principally the construction of roads, were having little effect in terms of improving the accessibility of the rural people.
The studies carried out since the mid 1980s by the World Bank and the ILO have demonstrated that improving rural accessibility has to be seen both in terms of improving the rural transport system so as to improve mobility and in terms of locating services so that the benefit of such services can be supplied to the maximum number of rural people. More recently this has lead to the development of the accessibility planning process which looks at transport both in terms of improving transport infrastructure, the provision of intermediate means of transport and improving rural transport services and also in relation to the location of services.

The results of the four studies have been used in this document as an input into the more general discussion of rural transport. The main theme of the document is that there needs to be a more systematic approach to the issue; that the issue of rural transport planning cannot be divorced from that of the planning of physical infrastructure such as water supply, classrooms and health centres. The document reinforces and lends support to the present trend towards a systems approach to the issue as exemplified in the development of accessibility planning.

Chapter 2 looks at the characteristics of rural travel and transport as evidenced in the studies that have been carried out in several countries over recent years. It identifies the particular aspects of transport in relation to basic needs activities, such as water, fuel and food collection, economic activities such as crop marketing and employment and for social services such as education and health. Taking accessibility as the key parameter, it goes on to identify the access needs of rural households both at subsistence level and at the level of the market economy.

Chapter 3 tackles the issue of the benefits of improved accessibility. If improved access reduces the time, effort and money spent on transport and reduces isolation, what are the individual and collective benefits of this saving? This is a key issue in terms of being able to justify investment in a more holistic approach to the provision of access.

Chapter 4 looks at the main elements of the solution to the lack of access. On the one hand is the question of the location of facilities and services on the other are the means to improve mobility, transport infrastructure, means of transport and transport services.

Chapter 5 identifies the important aspects of the attempts to develop a more integrated approach to rural transport which has resulted in the emphasis on accessibility.

Chapter 6 describes the process of accessibility planning and shows how the various elements examined in the four case studies can be incorporated into the planning process. It also draws attention to the lessons already learned and the issues still to be resolved in the development of the process.

Finally the annexes summarise the methodology and results of the four case studies in Kenya, Indonesia, India and the Philippines.
CHAPTER 2

CHARACTERISTICS OF RURAL TRAVEL AND TRANSPORT

This section briefly reviews the characteristics of rural travel in terms of trip purpose, factors affecting the extent of travel and load carrying and modes of transport. Available data is summarised to show typical transport patterns for rural households and the relative magnitudes of the various transport components.

Travel and transport are related to needs of access to facilities or services and movement of goods. These can be broadly broken down into four categories: subsistence, economic, improvement of human capital and other social and business purposes.

2.1 Transport to meet daily subsistence needs

The basic subsistence needs are water, food and fuel for cooking. Access to these basic commodities and transport of adequate quantities for subsistence is the overriding priority for most rural households.

2.1.1 Water

The basic daily need for drinking water is 1.8 to 3 litres per person. In addition water is needed for cooking, bathing and washing clothes and utensils. A recommended minimum total daily consumption for reasonable healthy living is 25 litres per person. There is some evidence (1) to suggest that "quantity" may be as important or even more important than "quality" since infections may originate more from poor hygiene rather than from drinking contaminated water. Since water is transported primarily by walking and carrying, and 25 litres is towards the upper limit of what can be carried, it is clear that collecting water is a major transport burden involving several trips per day for a household. However, for households that live reasonably close to the water source the burden may be substantially reduced by members bathing and washing clothes at the source so that only water mainly for cooking and drinking is transported.

Studies in Zambia (2), for example, found that in one area where households travelled an average of 5 minutes to the water source the average daily volume transported was 10.5 l per person, whereas in another area where the average travel time was 21 minutes the average volume transported was 17 l per person. Although there may be other relevant variables, the results illustrate a definite trend that households with poorer access to a water source not only have to travel further but may also have to transport greater volumes. For instance, for the cases mentioned above, an average household in the area with good access spent 179 hours transporting 17.5 tonne of water per annum whereas the average household with poor access spent 1439 hours transporting 35.5 tonne of water. Because of the much heavier transport burden it is likely that households with poor access to a water source will have a lower daily consumption of water with a possible lower level of hygiene, although there appear to be no clear statistics on this.
The level of access and transport of water may vary seasonally. Particularly in more arid regions, sources of water may dry up in the dry season causing households to travel to more distant and more permanent sources. In some cases households may be able to collect and store rainwater in the wet season, or a communal storage facility might be built for a group of households. Innovations such as this can significantly improve access to water and reduce transport needs.

A factor which can significantly increase household consumption of water is the use of a vehicle for transporting the water, since even a wheelbarrow can increase the volume moved per trip by 3 to 4 times. For example, in Kathekeni, a relatively arid area in Eastern Kenya, the introduction of handpumps has allowed some households to save up to 2 hours per day in transporting water and at the same time to transport extra water to irrigate vegetables for earning income. However, the environmental impact of this type of innovation on a larger scale needs to be carefully monitored.

Nevertheless the use of vehicles is rare - even if households own a vehicle water may still be collected by walking since vehicles are usually controlled by men and are intended primarily for income-generating transport activities. However, if water has also to be transported for livestock, as in the Kenya Case Study (Annex 1), the volume needed is too large to carry manually and a vehicle has to be used.

2.1.2 Food

At subsistence level, production of food for the household is likely to involve travel and transport for the following activities:

- collection of inputs such as seeds and possibly manure or fertiliser
- travel to and from the household plot for tillage, planting, care and weeding of the plants and harvesting
- transporting produce from the plot to the household dwelling
- transport of produce to a grinding mill.

It is difficult to generalise transport needs for subsistence agriculture because of differences in crops grown, quality of land and farming practices. However, subsistence plots are typically 0.5 to 2 ha and usually located within 2 km of the homestead. Trips for cultivation may range from 100 to 200 per year per household and up to 180 kg of fertiliser might be used. Typical crop production for subsistence is 300 to 400 kg per adult member of the household per year, or around 800 to 2000 kg per household per year. If this has to be carried manually it imposes a very heavy transport burden on the household over the short harvesting period. This is roughly the same amount which will need to be transported to a grinding mill. Trips to a grinding mill may be 5 to 10 km, so that this is a relatively heavy transport burden in terms of tonne-km (ie load x distance moved), although this is spread over the year.

2.1.3 Fuel

Fuel is needed for cooking and will primarily be firewood. Transport needs will depend very much on demography and local vegetation. In more densely populated areas access to firewood is usually poor, involving collection at considerable distance from the homestead. In sparsely populated areas firewood is usually readily available within close distance of the homestead. An analysis of survey results from 4 countries - Indonesia, Philippines, Tanzania and Zambia - showed an average household consumption of between 10 and 20 kg of firewood per day and one-way trip distances varying from 2 to 7 km. There is no apparent relationship between level of access (trip distance) and consumption. The predominant mode of transport is walking, requiring trips every day or every second day.

Collection of firewood often incurs environmental problems due to degradation of vegetation and improvements in access need to consider non-transport options - for example, planting of woodlots for
harvesting on a sustainable basis; use of improved stoves with lower fuel consumption; and use of alternative fuels such as bio-gas.

2.2 Travel and transport for economic purposes

As households move from mainly subsistence living into a market economy their needs for access, travel and transport increase and in turn their economic development becomes increasingly dependent on good access to facilities and effective means of transport.

Economic development starting primarily in the agricultural sector may gradually lead to other non-agricultural opportunities which will create additional needs for travel and transport.

The main needs may be grouped under agricultural activities; access to both agricultural and non-agricultural work; trading, provision of services, and general commercial development.

2.2.1 Agricultural activities

Once households have fulfilled subsistence needs, surplus produce can be sold at a local market or, to achieve high prices, at a more distant external market. The latter will particularly be the case if households are within reasonable distance and have good access through transport services to a town or rural centre. If marketing opportunities exist, then households may attempt to increase yields through using more fertiliser or manure on their land and also to increase their holding size, probably requiring acquisition of land further away from the homestead. They may also use additional land-holding to diversify into cash crops such as coffee, cotton, sugar etc....... which will need to be transported to depots or collection points.

The substantial jump in transport needs when moving from subsistence agriculture into marketing are illustrated in Table 2.1 (3) which compares production and transport needs for "successful" and "unsuccessful" farmers. The categories are based on the income levels of the farmers, "unsuccessful" being at about subsistence level and "successful" generating a good income.

Table 2.1: Increase in transport needs when moving from subsistence agriculture into marketing (Ref 3)

<table>
<thead>
<tr>
<th>Location</th>
<th>Lusaka Rural Zambia</th>
<th>Kaya Burkina Faso</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification</td>
<td>Unsuccessful</td>
<td>Successful</td>
</tr>
<tr>
<td>Average area cultivated (ha)</td>
<td>0.98</td>
<td>3.47</td>
</tr>
<tr>
<td>Fertiliser used (kg)</td>
<td>165</td>
<td>899</td>
</tr>
<tr>
<td>Produce harvested (kg)</td>
<td>788</td>
<td>10,498</td>
</tr>
<tr>
<td>Transport time (hrs)</td>
<td>2.1</td>
<td>11.1</td>
</tr>
</tbody>
</table>

| % households marketing | 36 | 100 | 16 | 100 |
| Produce marketed (kg)   | 259 | 8,958 | 55 | 480 |
| Transport time (hrs)    | 1.2 | 28  | 3.9 | 24.7 |
| % sold in local market  | 63 | 4   | 40 | 47 |
The table shows average data per household. Comparing the amounts moved and transport times needed it is clear that marketed produce has to be transported over considerably longer distances than the harvested produce, particularly, as in the cases shown, when a large percentage is marketed "externally". Economic development of agriculture therefore introduces the need for much improved access to external facilities of markets and input sources and to effective means of transport. In the Zambia study, 38% of "successful" farmers used ox-carts and 31% motor transport services to transport produce to market, whilst in the Burkina Faso study, where amounts transported were much less, only 7% used carts, 39% bicycles and 43% walked.

The importance of external access and effective means of transport is also illustrated in the Indonesia Case Study (Annex 2). Although trucks were used for only 0.5% of trips in the transport survey, they transported 57% of the goods moved with an average trip length of 40 km. It is clear that the economies of the farms in the area depend upon access by truck and road to the markets in the rural centre of Garut.

2.2.2 Agricultural and Non-agricultural work

As farmers move into a market economy and increase their land holdings, they will have an increasing need for part-time labour at peak periods of activity. For example, the studies from which data is quoted in Table 2.1 provide the following average data on hire of labour per annum:

Zambia: 4.2 work days by "unsuccessful" farmers; 10.8 work days by "successful" farmers.

Burkina Faso: 10 work days by "unsuccessful" farmers; 27 work days by "successful" farmers.

In addition, general economic development of the district will create non-agricultural jobs such as in roads and building construction, supply and service facilities and general commerce. Many of these jobs will be created in the rural centres that develop to support a growing agricultural economy.

The Indonesian Study (A2) shows a significant travel component for non-agricultural work of 13.3% of all trips recorded, with an average trip length of 4.1 km. The long trips indicate extensive external travel, probably mainly to the district centre Garut, in this case largely by walking or minibus since the district is too hilly for convenient use of bicycles.

In order to take advantage of these work opportunities rural people need access on paths, tracks or roads throughout the year and particularly for non-agricultural work access to personal transport - for instance bicycles for trips up to 10 km and motorised transport services for longer trips.

The importance of non-agricultural work to some rural households is illustrated by reported cases in Malawi of persons cycling up to 60 km into Blantyre for work.

2.2.3 Trading, provision of services and general commerce

As the level of agricultural marketing and cash economy grows there will be increasing opportunities for traders, providers of services and general business. Small traders access to a means of transport can transport goods from local centres to sell in the neighbouring villages - for example fish, bread, flour, kerosene etc. This not only provides income generation but also improves access of villagers to a range of goods. A good example is a programme of dissemination of bicycle trailers implemented by Intermediate Technology in Sri Lanka (4). Almost 200 have been introduced to date, the majority being used by small traders to sell goods in local villages. A loan for a trailer can typically be paid off in 6 to 12 months.

Economic development of a district leads to expansion of business and commerce which requires increasing access to external sources of supplies and market outlets. This is amply demonstrated by
the Indian Rural Transportation Study (Annex 3) where studies eleven years apart (1976 and 1989) show average growth rates of 15% per year for goods transported into the villages studied and 9.3% per year for goods transported out of the villages. Economic development not only generates the increase in external transport but is also dependent on effective levels of external access to sustain growth.

2.3 Travel and transport for development of human capital

Even at subsistence level there are substantial travel needs for education and health services and with economic development these demands will increase and additional demands will grow with increases in income and standard of living. These needs are essential to developing human capital at both household and national level.

2.3.1 Education

Levels of primary education are generally high and travel of young children to school is a substantial transport component. For instance, in the Indonesian Study (A2) they are the largest component at 26% of all trips. Travel is primarily by walking, although the World Bank recommends that transport should be used if the distance is greater than 2.5 km. It would be expected that poor access due to excessive distance, poor paths or tracks and lack of transport might constrain attendance at school but no data has been found on this. A good indicator might be if percentage attendance in urban areas where access is better is greater than in rural areas, but no data has been found on this. A less direct indicator might be a comparison of level of urbanisation with percentage enrolment for primary education. This is shown in Figure 2.1 using data taken from the World Bank World Development Report, 1995(5). This does show some indication that registration is higher in more urbanised countries and it may be significant registrations are higher in Asia where means of transport and transport services are more readily accessible than in Africa. Although other factors such as availability of school places, government policy and cultural attitudes may also have a bearing on the relationship it does seem likely that poor access constrains involvement in primary education and it does seem even more likely to constrain actual attendance.

A study in rural areas of Sierra Leone (6) showed a link between attendance at school and level of access, although this was not clear cut. Generally, attendance was highest in villages which had their own primary school or which were within short distances of primary schools.

It is likely that poor access is a greater constraint on secondary education where enrollment levels are much lower, generally less than 30% and in several Sub Saharan African countries less than 10%. Secondary schools are limited and usually located in larger rural centres so that access from rural areas in often poor involving long trips which are only practical if motorised transport services are available. Although secondary school places are limited it seems very likely that rural children are penalised relative to urban children by constrained access to the available schools.

Poor access also imposes a constraint on availability of teachers in more isolated rural areas. Teachers prefer to be located close to rural centres or major access routes and generally resist being located in more distant village schools.

2.3.2 Health Services

Lack of access to health services, particularly in emergency situations, is probably one of the greatest worries of isolated rural households, especially for parents of young children. Basic health care is often available at village level through a nurse or health care workers. However, access to a doctor is limited and to a hospital even more so. Travel to the nearest hospital may involve trips of 50 km or more, taking several hours. Transporting a sick or injured person to hospital may involve carrying or moving the person in a wheelchair or cart to the nearest motorable road and then seeking a lift from a passing vehicle.
Fig. 2.1: Comparison of level of enrolment in primary education with level of urbanisation for various countries (data from reference 5).
Health care centres or clinics are usually located in district centres and access may involve quite long trips for households. For instance in the Indonesian study (A2) the average distance to a clinic is 4.8 km with 20% of trips taking over 1 hr and 7% of trips over 2 hrs. The average trip time of 42 minutes indicates that vehicles are commonly used for these trips. The problems of access for health care are further illustrated by the data in Table 2.2 taken from the World Bank SSATP (2).

Table 2.2: Access to health care facilities in SSA (2)

<table>
<thead>
<tr>
<th>Location</th>
<th>Zambia (Kasama)</th>
<th>Zambia (Lusaka Rural)</th>
<th>Uganda (Mbale)</th>
<th>Burkina Faso (Kaya)</th>
<th>Burkina Faso (Degoudou)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Distance to Health Clinic (km)</td>
<td>21</td>
<td>3.5</td>
<td>4.3</td>
<td>6</td>
<td>8.5</td>
</tr>
<tr>
<td>% HHs visiting in last month</td>
<td>0.19 visits per hh</td>
<td>65</td>
<td>53</td>
<td>10</td>
<td>47</td>
</tr>
<tr>
<td>Mode (in HHs)</td>
<td>Walk</td>
<td>81%</td>
<td>94%</td>
<td>92%</td>
<td>21%</td>
</tr>
<tr>
<td>Time (min)</td>
<td>320</td>
<td>53</td>
<td>60</td>
<td>90</td>
<td>120</td>
</tr>
<tr>
<td>Bicycle</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>64%</td>
<td>75%</td>
</tr>
<tr>
<td>Time (min)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>54</td>
<td>75</td>
</tr>
<tr>
<td>Average distance to hospital (km)</td>
<td>98</td>
<td>65</td>
<td>53</td>
<td>10</td>
<td>47</td>
</tr>
<tr>
<td>% HHs visiting in last year</td>
<td>0.91 visits per hh</td>
<td>49</td>
<td>64</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>% HHs using a vehicle</td>
<td>100</td>
<td>97</td>
<td>89</td>
<td>85 bicycle</td>
<td>54 bicycle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>23 motorised</td>
<td>48 motorised</td>
</tr>
</tbody>
</table>

The table shows up the following features:

- Trips to the health clinic are primarily by walking, taking an average at least one hour each way, but are infrequent - most households seem to visit the clinic about 6 to 8 times per year. The data from Burkina Faso shows the significant time saving (40%) of having access to a bicycle.

- Trips to hospital involve lengthy trips, particularly in sparsely populated areas, which are often only feasible using some form of motorised transport. Information on the trip time for Lusaka Rural shows an average of 90 minutes walking and 109 minutes by motorised transport, giving a total of 199 minutes each way for the 40 km trip.

The data does not show any relationship between difficulty of access and percentage of households using the facilities, although it seems likely that the distances to be travelled and time involved must constrain households from not using the facilities as much as they should.

One answer to the problem of access is for health care workers to visit villages on a regular basis. This is done in some regions but involves lengthy travel which is only feasible using a vehicle. Bicycles are used in some cases and in another innovative scheme an NGO, “Riders for Health”, has trained health care workers to use motorcycles in districts of Ghana, Lesotho and Zimbabwe (7). Another possibility is to establish a motorised transport service to serve a village or small group of villages. In a pilot scheme set up by Intermediate Technology in Sri Lanka using a motorcycle trailer, about 60% of usage has been for visits to health centres and hospital.
2.4 Travel and transport for other social purposes

Households make other trips both inside and outside the village for a range of purposes which may be essential - Church, visits to government offices or business - or mainly social - visits to friends, leisure and sport. These trips are likely to become more frequent as households move more into the cash economy and are very important to improving the quality of life for rural people. In the Indonesian Study (A2) these trips constitute 22% (about 3 trips per household per week) of total trips and for external travel involve considerable distances:

- business trips; 3.5% of trips; 21.4 km average distance
- leisure and sport; 7.2% of trips; 11.1 km average distance
- shopping; 7.0% of trips; 7.1 km average distance
- official; 2.0% of trips; 3.2 km average distance

The data from the SSATP Study appears to show a marked effect of level of access on the frequency of external trips for "other" social purposes:

- Kasama; 4 to 8 hour average trip; average 4.5 trips per household per year
- Degoudou; 2 to 3 hour average trip; average 20 trips per household per year
- Mbale; 2 to 3 hour average trip; average 90 trips per household per year

Trips involve considerably longer times than in Indonesia and frequencies are considerably lower. However, other factors such as availability of facilities, household income levels, and culture may also have important effects as well as level of access. The problems of isolation and lack of access are well illustrated by the data for Kasama where households are largely confined to their own locality.

2.5 Overview of patterns of travel and transport

In rural areas access needs and patterns of travel and transport are largely dependent on subsistence needs and agricultural activities, including marketing. They therefore vary from region to region depending on topography, types of agricultural activity and practices and local culture and tradition. However, it is possible to identify some general trends in access needs.

The trends in patterns of travel and transport for rural households at slightly different stages of development are summarised in Figures 2.2 and 2.3 (from Reference 8). The figures show data from household surveys carried out in 3 rural areas:

1. Makete District in the remote south-west of Tanzania, a poor highland area with low population density. 431 households were surveyed, representing predominantly subsistence level farmers who market only very limited amounts of their produce (less than 1 or 2%). Travel and transport is predominantly by walking.

2. Three areas in different regions of Ghana. Eight villages typically remote from urban centres were surveyed. The households surveyed were slightly more developed than in Makete, marketing roughly 10-15% of their produce, a significant portion in external markets. However, walking is still the main mode of transport and ownership of vehicles is limited. About 25% of households own bicycles, used mainly by men for personal transport and for transporting some produce to external markets, and there are a few donkeys used for carrying loads.
Figure 2.2: Travel and transport patterns of typical households in three countries

**MAKETE**

- Water collection
- Firewood collection
- Crop harvesting
- Grazing
- Crop production
- Ext. crop marketing
- Other

<table>
<thead>
<tr>
<th>%</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1772 trips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**GHANA**

- Water collection
- Firewood collection
- Crop harvesting
- Grazing
- Crop production
- Ext. crop marketing
- Other

<table>
<thead>
<tr>
<th>%</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>4224 trips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AURORA**

- Water collection
- Firewood collection
- Crop harvesting
- Grazing
- Crop production
- Ext. crop marketing
- Other

<table>
<thead>
<tr>
<th>%</th>
<th>0</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1914 trips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Number of Trips/Annum**

**Time Spent/Annum**

**Tonne-km/Annum**
<table>
<thead>
<tr>
<th></th>
<th>Makete District Tanzania</th>
<th>Ghana</th>
<th>Aurora Philippines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Trips</strong></td>
<td>Internal 91%</td>
<td>Internal 93%</td>
<td>Internal 93%</td>
</tr>
<tr>
<td><strong>Time Spent</strong></td>
<td>Internal 80%</td>
<td>Internal 73%</td>
<td>Internal 56%</td>
</tr>
<tr>
<td><strong>Load Carried</strong></td>
<td>Internal 96%</td>
<td>Internal 91%</td>
<td>Internal 87%</td>
</tr>
<tr>
<td><strong>Transport Effort (tonne.km)</strong></td>
<td>Internal 81%</td>
<td>Internal 76%</td>
<td>Internal 35%</td>
</tr>
</tbody>
</table>

*Figure 2.3: Relative Proportions of Internal and External Travel in 3 Rural Areas*
3. Aurora is a narrow, coastal province in the north-east of Luzon in the Philippines. Access roads in the province are generally poor and may become impassable in the high rainfall, wet season. The study was carried out in 22 communities and covered 342 households. The general level of development of surveyed households seems to be roughly on a par with those surveyed in Ghana with around 8% of crops being marketed, 4.5% externally. The significant difference is the much higher use of means of transport. Around 65% of households owned some form of vehicle, generally a buffalo-drawn cart or sledge (50% of households). These were used in internal movement of crops whilst motorised transport services, motorcycle 3-wheelers (sidecars) and jeepneys, were widely used for external marketing of crops.

The levels of access to various facilities and services in the three survey areas, measured in terms of the average times for a one-way trip, are recorded in Table 2.3.

<table>
<thead>
<tr>
<th>Survey location</th>
<th>Water</th>
<th>Firewood</th>
<th>Cultivated land</th>
<th>Dispensary</th>
<th>Hospital</th>
<th>Grinding Mill</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tanga</td>
<td>31 mins</td>
<td>44 mins</td>
<td>N/A*</td>
<td>1hr 45mins</td>
<td>N/A</td>
<td>1hr 51mins</td>
<td>2hrs 37 mins</td>
</tr>
<tr>
<td>Makete</td>
<td>23 mins</td>
<td>1hr 38 mins</td>
<td>1hr 5 mins</td>
<td>1hr 36 mins</td>
<td>5hrs 40 mins</td>
<td>1hr 42 mins</td>
<td>3hrs 18 mins</td>
</tr>
<tr>
<td>Ghana</td>
<td>25 mins</td>
<td>43 mins</td>
<td>48 mins</td>
<td>1hr 40 mins</td>
<td>2hrs 36 mins</td>
<td>26 mins</td>
<td>2hrs 8 mins</td>
</tr>
<tr>
<td>Aurora</td>
<td>5 mins</td>
<td>27 mins</td>
<td>11 mins</td>
<td>25 mins</td>
<td>1hr 54 mins</td>
<td>21 mins</td>
<td>2hrs 8 mins</td>
</tr>
</tbody>
</table>

* Average figure not available. However 80 per cent of households have fields within a 30 minute walk.

Figure 2.2 shows a breakdown of the main purposes of travel and transport in terms of percentage trips, percentage time for each purpose and transport effort (measured by load x average distance moved in tonne-km). Figure 2.3 shows the relative components and importance of internal and external travel and transport.

The main significant features of the transport patterns are:

- the travel recorded does not include educational trips
- at subsistence level (Makete) the major transport burden is internal. This comprises a large number of trips moving relatively small loads (20 to 30 kg) over short distances. Observations show that most of this travel is on local paths and tracks.
- at subsistence level, the collection of water and firewood constitute a large portion of the transport load. This is particularly the case for Makete where access to these resources is poor. The average time devoted to these activities in Makete is 41% of transport time, roughly 1.4 hours per day per adult (3.5 hr/household). This represents around 15% of available productive time which must be a significant constraint on agricultural activities and opportunities. The comparative times for Ghana and Aurora are 0.8 hr (4.8 hr/household) and 0.3 hr (1.2 hr/household) per adult per day respectively. This shows the substantial benefits of time saving from better access to these resources, particularly in the case of Aurora.
- the total time spent on transport activities in Makete is 3.3 hr per adult per day i.e. 30 to 40% of normal working time. This represents only travel time and does not include any waiting time or time on actual activities such as drawing water. The comparative times for Ghana and Aurora are 2.5 hr and 0.5 hr per adult per day. The time saving is partly due to more adults per household (particularly Ghana) but in Aurora in particular it results much more from improved access and greater use of vehicles. The estimated time saving per household compared to
Makete, is 5 hrs per day in Ghana and 11 hrs per day in Aurora. Although there is no direct proof, it seems highly likely that these time savings play an important role in allowing households in Ghana and Aurora to move from subsistence farming to producing a surplus for marketing.

- although the average amounts marketed externally are small compared to total loads transported - 160 kg per household for Makete, 8,700 kg for Ghana and 1700 kg for Aurora - the increase in transport burden in terms of time and tonne-km is substantial because of the much longer trip lengths involved. The benefits of effective transport services are clearly shown by comparing the amounts moved and the time taken:

<table>
<thead>
<tr>
<th>Area</th>
<th>Amount marketed Externally - (tonne)</th>
<th>Transport effort (Tonne-km)</th>
<th>Average trip Length (km)</th>
<th>Time taken (Hours)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Makete</td>
<td>0.16</td>
<td>1.38</td>
<td>8.6</td>
<td>20</td>
</tr>
<tr>
<td>Ghana</td>
<td>8.7</td>
<td>52.0</td>
<td>6.0</td>
<td>821</td>
</tr>
<tr>
<td>Aurora</td>
<td>1.7</td>
<td>32.2</td>
<td>18.9</td>
<td>103</td>
</tr>
</tbody>
</table>

The time taken per tonne-km for Makete and Ghana are roughly the same as expected since walking is the predominant mode of transport in each case. Taking the same ratio (hrs per tonne-km) for Aurora would give a time of about 480 hr so that availability of effective transport services gives a massive time saving of 480 - 103 = 380 hr (nearly 80%).

2.6 Gender Issues

Three of the dominant characteristics of rural transport are - i) the high proportion of transport carried out by walking; (ii) the heavy burden this places on rural households in time and effort; (iii) the high proportion of this burden that is carried by women. The latter characteristic is generally true throughout Sub-Saharan Africa but is more variable in Asia where there are a wide range of cultures which govern women's role and it is more difficult to make generalisations. Nevertheless the overall picture shows that rural women carry a very heavy transport burden, almost entirely by walking and carrying loads on head, back or shoulders.

Figure 2.4 shows a breakdown of the transport burden for typical rural households in two African situations and two Asian situations in terms of grouped activities and gender division. The figure shows that in the African countries women are responsible for about 90% of domestic transport - water, firewood and visits to the grinding mill - so that in predominantly subsistence level households, such as Makete, women tend to be responsible for 80 to 90% of the total transport task. When the household moves into marketing of surplus produce the proportion of the total transport task carried out by women tends to drop, for instance in Ghana it is 80 to 70%, but their actual burden is increased due to additional transport of produce from the fields and to markets. The average time spent on transport by women is about 4.5 hours per day in Makete and 8.4 hours per day in Ghana. However, in Ghana household sizes are substantially larger so that the task is likely to be shared by two or three women, whereas in Makete it is more likely to be carried by a single woman. The high proportion of time taken up in transport in Makete is largely due to poor access to water and firewood - women may spend 2 or 3 hours a day in these activities.

1/ This section is largely based on an issues paper prepared for the Intermediate Technology Development Group, Rugby, UK: Jo Doran: An Imbalanced Load: Gender Issues in Rural Transport Working Draft June 1996.
The data for the two Asian situations shows a much lower involvement of women in household transport activity. This may be partly due to cultural or religious influences and partly due greater use of means of transport or transport services in these locations. It is also evident from comparing the load in tonne.km with the time taken that accessibility is much better in these areas, particularly for domestic needs such as water and firewood. Although an accurate breakdown is not clear from the Indonesian Study (A) the transport load and time taken for domestic needs are less than 10% of the totals. There is little data available from other Asian countries, but from observation it seems probable that there are locations where due to different cultures and levels of access the transport burden of women in disproportionately high.

An extra transport load, which is often forgotten, is that women may have to carry babies when carrying out their other transport or agricultural tasks. Carrying a baby weighing say 10 kg over a distance of 3,000 km per year imposes an extra load of 30 tonne.km.

In many rural societies women play an important role in agriculture in addition to being fully responsible for running the household and for child care. The excessive time taken up in transport activities therefore constraints their input to both productive activities and the important task of seeing to the welfare of the family. It is generally recognised that transport is one of the major burdens for rural women and that carrying quite heavy loads on head, back or shoulders imposes significant physical strain on women which may well affect their health.

Many development projects with transport components now include an objective to reduce the transport burden of women, usually through attempting to increase their access to IMT. Use of IMT by a household usually does help women to some extent since men assume control of the IMT and take over some of the transport tasks. However, this often extends to only economic related tasks of crop production and marketing, and women may still have to carry out domestic transport tasks by head or other forms of carrying. For instance, in the Kenya Study (A1) although 43% of households owned donkey carts they were only used for collecting water if additional water was needed for livestock, and 87% of firewood was still collected by women by head loading. It appears that women are often regarded by men as a “free” means of transport and the opportunity cost of their time is not recognised. Even a wheelbarrow can reduce the time to transport water by a factor of 5%, and if a women spends 900 hours per year transporting water this can give a time saving of 600 hrs. If 50% of this time is used in productive activities at an opportunity cost of 10c per hour this would give an equivalent saving of $30 which would quickly cover the cost of the wheelbarrow. However, changing traditional attitudes is likely to take many years.

Improving women’s direct access to IMT is also difficult. Men usually make decisions on household investments, and even if a woman has her own source of income it is usually difficult for her to obtain credit or she may not wish to invest in an IMT if it is likely to be taken over by her husband. Female-headed households where women can make decisions are often too poor to afford an IMT. There may also be traditional, cultural or physical barriers to women using IMT. For example: cultural norms may discourage women from riding bicycles or only men’s bicycles may be available; women are not considered strong enough to handle an ox-drawn cart; and devices such as hand-carts and bicycle trailers may be designed for men and be too large and heavy for women.

The impact of efforts to relieve the transport burden of women has therefore so far been quite limited, and benefits achieved have been largely indirect through men taking over some transport tasks. However, there are some hopeful signs. Doran reports on a project in Kajiado in Kenya where women have been helped to adopt donkeys for carrying water and there seems to be some potential for use of donkeys on a wider scale to provide a means of transport for women. There have also been a few cases where considerable success has been achieved in increasing the use of bicycles by women (9, 10). Bicycles greatly increase the mobility of women and open up access to women’s groups and various sources of information which can help them in developing their lives. It is possible that working with women’s groups to gradually break down traditional barriers and to enable women to achieve more control over their lives may be the most effective way of reducing women’s transport burden.
Figure 2.4: Proportion of Household Transport Task Carried out by Women
2.7 Accessibility is the REAL Issue

Travel and transport are the means by which people gain access to the facilities and services they need for everyday life. Travel and transport are therefore a means to an end, the real need is accessibility. Rural households need access to an increasing range of facilities and services as they develop economically and socially and without this access, development will be restricted.

Travel and transport involve time, effort and cost. These are the measures of the level of access to facilities and if they are too high they constrain opportunities and potential for development. The aims of accessibility planning should therefore be to minimise the need for travel and transport and to make that which is essential as efficient and cost-effective as possible.

2.7.1 Access Need of Rural Households

From the above review of travel and transport characteristics of rural households the main access needs are summarised as follows:

1. At subsistence level:
   - access to water, food and firewood are the primary needs.
   - good access to water is particularly important since several trips are needed per household per day (0.8 to 1 trip per day per adult member of household). An adequate supply of uncontaminated water is important for the health and hygiene of households, particularly young children.
   - access to firewood is not as critical since only 0.7 to 1 trip per day is needed for the household.
   - poor access to these basic resources, involving excessive time in transport, may well constrain potential to produce surplus crops to move into the market economy.
   - the distance to the household plot is not usually great but transport of produce at harvest can be a constraint due to the large transport need in a short period of time. Availability of a means of transport is important for this.
   - access to a grinding mill is needed to eliminate the considerable effort involved in grinding by hand. This usually requires a relatively heavy transport effort due to the combination of load and distance.
   - access to education is very important for the future development of both families and the nation as a whole.
   - access to health care is important to the well being of the household and to maximise the availability and productivity of labour capacity in the household.

2. At market economy level:

As households progress from mainly subsistence living to marketing of crops and other economic activities they will have an increasing range of access needs and demands, mainly external to the village. In addition to basic needs these will include:

- good access to markets, particularly external, is needed to get good prices for produce with the least cost penalty for transport.
- a greater need for access to resources - fertiliser, tools, equipment and other
agricultural and household inputs

- an increasing need for access to business, financial and government facilities.

- as communities develop an increasing proportion of households depend on work, agricultural and non-agricultural, for income. External access to local rural centres is important for non-agricultural work opportunities.

- an increasing demand for access for social reasons - leisure, sport, shopping - which will be mainly external to the village. These are important to improving the quality of life of rural people.

The economic growth of a district is dependent on good access to external sources and markets and there will be an increasing demand for access by business and commerce. The transport of goods into and out of the district will be greatly increased.
CHAPTER 3

BENEFITS OF IMPROVED ACCESS

Chapter 2 has emphasised that the real issue in rural transport is the need for rural households to have effective access to the facilities that serve their subsistence, economic and social needs. The aims of intervention to improve rural transport should therefore be to upgrade access to facilities to an acceptable level. The benefits gained from improved access are two fold - i) the direct benefits flowing from easier access to specific facilities in relation to the services provided by the facilities; and ii) the secondary benefits accruing from savings in transport time, effort and cost. The benefits flowing from gaining access to facilities (i) are covered in the discussion of access needs in Chapter 2. The benefits that accrue from improving access (ii) are discussed in this chapter. The methods for improving access are discussed in Chapter 4.

Although the potential benefits which should result from improvements in access may seem evident the actual impacts achieved are dependent on the attitudes and behaviour of households and may therefore not be as hoped or planned or there may be accompanying effects which were not foreseen. For example, Reference 11 cites the case of a rural development programme in the Southern Highlands of Papua New Guinea involving the construction of highway and feeder roads to improve the access of an isolated area to economic opportunities. This was achieved to some extent with an increase in the marketing of coffee and a rise in flow of goods into and out of the area. However, two serious side-effects emerged: i) forest clearance for the highway allowed mosquitoes to penetrate into parts of the area where previously they were not found causing a dramatic rise in malaria; ii) construction workers employed on the project introduced sexually transmitted diseases to the communities that had previously been largely isolated from the outside world. This is a relatively extreme example but it illustrates the need to identify all relevant factors and to include them in the planning process. The integrated systems approach advocated in Chapter 5 is an effective approach to bringing together and identifying the links between the relevant factors.

In order to improve the chances of success in achieving benefits anticipated from improvements in access, it is essential to include communities in the planning process. Village-level discussions should seek opinions on access improvements needed and the benefits expected from them. It is particularly important to assess their commitment to increasing agricultural production when the aims of interventions are to improve access to markets to stimulate agricultural development.

Direct evidence on benefits achieved from improved access is quite limited and is mainly in the form of increased traffic flows on roads or tracks that have been upgraded to improve access. Evidence of benefits from other approaches to improving access such as increasing the availability of means of transport is largely circumstantial. The limited availability of data on the impact of access improvements is also noted in Reference 12. It is an area in which more monitoring and evaluation is needed in order to learn lessons to refine planning and interventions for improving access.

3.1 Benefits from time saving

One of the main characteristics of rural transport shown up in Chapter 2 is the large amount of time taken up by households, particularly women, in gaining access to the facilities which serve their domestic, economic and social needs. This may significantly constrain time available for productive and other activities which benefit the welfare of the household.
The majority of studies on time saving have concerned women and access to water and firewood. A number of cases of the impact of improved water supplies have been recorded (13) with time savings from around 20 to 100 minutes per household per day. However, the evidence on the benefits obtained from time saving is inconclusive. In some cases, improved access encourages greater use of water so that net time saving may be small. For example, Reference (13) cites a case from Mozambique where daily water consumption per person increased from 3.24 to 12.30 litres per day after improvement in access. Another example, quoted in Reference (14), from Western Kenya showed an increase from 100 to 127 litres per household per day. In the first case the daily consumption is much below the recommended level of 25 litres per adult per day whereas in the second it is probably approaching this level. This may partly explain the extent to which improved access to water results in increased consumption.

The evidence on the impact of time savings in subsistence activities is summarised in Reference (15) mainly in relation to the Sub-Saharan Africa context. The general conclusions are:

- if the time taken up in transport has been mainly at the expense of family welfare then women tend to use the time saved to counterbalance this.
- where family welfare is manageable, opportunities exist for additional agricultural production and women have control over extra earned income, part of the time may be invested in producing crops for marketing.
- where family welfare is manageable, women may use time saved in other income-generating opportunities that exist.

The fact that time saved through improved access may well be used in productive activities suggests that it should have an opportunity cost. However, as discussed in Section 2.6, this and the related economic benefits to the household seem to be seldom recognised. For example the use of an IMT to collect water and firewood could have a high rate of return on the investment in terms of the opportunity cost of time saved.

The evidence that is available on benefits from time-savings accruing from improvements in access to other facilities is mainly circumstantial. For instance the suggestion in Section 2.5 that time savings on a household's overall input to transport may provide the opportunity to increase agricultural productivity in order to produce a surplus for marketing.

3.2 Benefits from reduced effort in transport

Transport effort is considered here to be concerned with the effort of moving loads, where loads are considered in tonne km ie the magnitude of load in tonne x the distance it has to be moved in km.

Effort may be reduced by improving infrastructure to make transport of goods easier, reducing the distance over which goods must be moved, using a more efficient means of transport or replacing human effort with animal or motorised power. The benefits gained from these improvements result from the capacity to transport greater loads over greater distances.

Although some increase in movement of goods often results from improvements in infrastructure, the predominant impetus for increasing load-carrying capacity is the introduction or greater use of means of transport and transport services. Improvements in infrastructure may encourage households to transport more goods to market or remove constraints on the use of vehicles. An example of the former is the case of Makete in the Southern Highlands of Tanzania where improvements to footpaths resulted in goods movements on "improved" paths increasing by 2.5 times as much as on "unimproved" paths - 61% compared to 26% over a period of 5 years (16). Average loads carried on improved paths also increased by 2 kg more than on unimproved paths.

The benefits from greater use of means of transport are discussed in Reference 15 based on findings from household studies in Sub-Saharan Africa. The main benefits are:
they allow greater inputs of manure and fertilizer to improve agricultural yields;

they allow more produce to be moved over greater distances thus providing opportunities to increase the area cultivated, particularly at further distances from the homestead. An example is cited of Degoucou in Burkina Faso where use of means of transport (IMT) had extended cultivation over an extra 2km radius around the settlement;

the capability of moving produce quickly at the right time, reducing deterioration, wastage and loss of income;

a greatly expanded capacity to transport produce to market, thus encouraging increased cultivation and production of crops;

Overall, the introduction or greater use of means of transport substantially increases the capacity of households to expand agricultural production and marketing.

3.3 Benefits from cost savings

Transport costs can substantially reduce the income that farmers receive from marketing their crops. Reference (17) estimates that typically small farmers in Sub-Saharan Africa receive of the order of 30 to 50% of the value of their crops due to limited availability and high operating costs of transport services. Major causes of high operating costs are poor infrastructure which restricts operating speeds and increased maintenance costs, and poor preventative maintenance of vehicles which increases their repair costs. Excessive penalties from transport costs may discourage farmers from increasing production because of the limited reward for extra effort. Improving access to reduce transport costs is therefore important to encouraging increased agricultural production.

The impact of poor infrastructure on reducing transport capacity (and therefore on increasing operating costs) is illustrated by the following specifications for gravel haulage in Lesotho:

- daily capacity per truck on good routes - 80 to 90 tonne km
- daily capacity per truck on poor routes - 50 to 60 tonne km

3.4 Importance of improved access to development

Chapter 2 has described the access needs of rural households which are essential for meeting their subsistence, economic and social requirements. Improving access to the resources and services that they need is a key factor in providing the opportunities and potential for economic and social development:

- improving access to subsistence needs benefits the welfare of the household and releases time for productive activities which are the basis for economic development of the household - it is particularly important to relieving the transport burden on women, providing them with opportunities for both household and self-development.

- improving access to markets, particularly external markets, is essential for increasing agricultural production which is the driving force for economic development of rural areas. Agricultural development is also very dependent on increasing the capacity for transport of goods.

- improving access to educational facilities is essential to both household and national development whilst improved access to health services safeguards the welfare and productive capacity of the household and relieves one of the major anxieties of isolated rural living.

- economic development increases the demand for improved access to a range of other facilities such as work opportunities and social, government and business services. These provide
important benefits to the overall quality of life of rural households.

As improved access is essential to the economic and social development of rural communities, so development brings a large increase in demand for access to a wide range of facilities and services, particularly with respect to the movement of goods. This is amply illustrated by the Indian Study (A3) which compares access and transport needs over a period of 11 years. The main features are shown in the following the tables.

Table 3.1: Changes in pattern of freight transport in rural Northern India, 1978 to 1989

<table>
<thead>
<tr>
<th>Category of Transport</th>
<th>Quantity in million tonnes</th>
<th>Transport load in million tonne km</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1978</td>
<td>1989</td>
</tr>
<tr>
<td>Internal, within village</td>
<td>486</td>
<td>417</td>
</tr>
<tr>
<td>Coming into village</td>
<td>21</td>
<td>95</td>
</tr>
<tr>
<td>Going out of village</td>
<td>86</td>
<td>236</td>
</tr>
</tbody>
</table>

This shows little change in internal village transport but a dramatic change in external transport, particularly goods coming into the village. The increase in external transport load is especially marked, indicating a wider search for the most financially advantageous markets and sources of goods. This indicates that economic development generates a large increase in demand for access to external facilities.

Table 3.2: Change in transport modes used for freight in rural North India

<table>
<thead>
<tr>
<th>Modes of Transport</th>
<th>% of transport load (tonne km) transported by different modes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inside village</td>
</tr>
<tr>
<td>Headload</td>
<td>19.4</td>
</tr>
<tr>
<td>Bullock cart and other animal-drawn carts</td>
<td>77.6</td>
</tr>
<tr>
<td>Bicycle-based</td>
<td>0.02</td>
</tr>
<tr>
<td>Tractor trailer</td>
<td>3.0</td>
</tr>
<tr>
<td>Conventiona l motorised buses, trucks etc...</td>
<td>0.06</td>
</tr>
</tbody>
</table>

This shows that a significant portion of internal transport of goods is still by headloading. There is also a significant increase in the proportion of goods headloaded into the village which is not explained -
possibly a result of reduced bullock cart transport into the village? The use of traditional bullock carts has declined, although they still account for about 50% of goods transport. For internal transport they have been replaced mainly by tractor-trailers and for external transport, mainly by conventional motorised transport. The table shows that internal transport of goods within the village has not changed greatly and is predominantly (almost 80%) by traditional methods of headloading and bullock carts. For external transport there has been a significant shift to motorised transport, emphasising the importance of motorised transport services for access to external facilities.

Table 3.3: Purpose of passenger trips in rural southern India 1989

<table>
<thead>
<tr>
<th>Purpose of trip</th>
<th>Percentage of trips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>17.4</td>
</tr>
<tr>
<td>Trade, commerce, business</td>
<td>15.1</td>
</tr>
<tr>
<td>Education</td>
<td>31.4</td>
</tr>
<tr>
<td>Health</td>
<td>6.2</td>
</tr>
<tr>
<td>Social</td>
<td>9.8</td>
</tr>
<tr>
<td>Others</td>
<td>20.1</td>
</tr>
</tbody>
</table>

A study of passenger movements was not included in the 1978 summary so that it is not possible to see a trend. Also, the breakdown of trips cannot be compared directly with data in Section 2.5 since Table 3.3 only includes passenger movements. However, the figures suggest a large growth in passenger trips for non-agricultural and non-domestic reasons, indicating that development generates a large demand for personal access to external facilities and services.
Accessibility is concerned with location of facilities, methods of travel and transporting goods to or from these facilities and the routes on which travel and transport take place. These issues are discussed in this chapter under four headings:

1. Location of facilities
2. Infrastructure
3. Means of transport
4. Transport services

Each section reviews the particular factor and how it affects access.

4.1 Location of facilities

The facilities to which rural households require access and their location is the key issue in defining access needs. In some cases facilities may be fixed by the physical environment, for instance natural sources of water such as springs and rivers or natural sources of firewood. In other cases there may be constrained freedom in selecting location, for instance wells, bore-holes and woodlots, or more or less full freedom - for example markets, grinding mills, schools, health facilities etc... Even where locations are fixed there may be options for improving access, for instance piping water to a more central supply source rather than improving access paths or tracks to the natural source.

Effective location or relocation of facilities improves access by reducing the distance and/or time that household travel to reach the facility. It is one of a number of non-transport interventions which are suggested if the basic need is defined as improving access rather than improving infrastructure or means of transport. The aim is to reduce the need to travel rather than making travel easier. Other possible options to improve access are:

• collection and storage of rainwater by households to reduce the need to transport water.
• development of woodlots to provide a sustainable supply of fuel wood.
• use of more efficient stoves which reduce the need for fuel wood.
• development of alternative sources of fuel such as biogas.
• provision of preventative health care services in the villages by travelling health care workers, thus reducing the need for households to travel to health clinics.

• development of village-based systems for secondary level education using the communication media, for instance community-based television or video.

Interventions such as relocation of facilities or development of woodlots can be particularly effective in that the benefits reach a substantial section of the community, usually at no cost to the household. They may especially benefit lower-income households that cannot afford a means of transport by reducing walking distances.

In planning to improve access through location or relocation of a facility a catchment area needs to be defined and also a desirable upper limit for travel time which should not be exceeded. Various locations may be considered to estimate the average travel time to the facility within the catchment area, with the aim of minimising the average travel time. Since travel time is also influenced by infrastructure and means of transport it is essential take an integrated approach. For instance if a particular area has excessive travel time to the facility because of poor infrastructure then it may be better to improve the infrastructure than to bias the location of the facility too far towards this area which would penalise other areas.

4.2 Infrastructure

One of the most obvious constraints on access to rural areas is the poor condition of infrastructure. By infrastructure in this context is meant roads, tracks, paths and their associated bridges and other forms of water crossing. For villages not located on a major highway, and this means the majority of villages in developing countries, the principal means of access is along roads - usually unsurfaced - paths and tracks.

In India 40% of villages in the 1000 to 1500 population range were reported to not have direct access to any standard of road, and 58% did not have access to an all-weather road. More than 78% of Indian villages are below 1000 population and, therefore, road access can be assumed to be worse than this for most small villages. In Egypt 22% of villages are not provided with even earth road access; they are connected to larger villages, and thence to the road network, only by footpaths. There are many countries that are poorer and, thus, may be presumed to have more severe rural access problems than India and Egypt.

In sub-Saharan Africa it is generally acknowledged that the overall condition of the road network has deteriorated over the last ten to twenty years, mainly due to inadequate road maintenance. To tackle this problem government road authorities have been forced to focus their efforts on the rehabilitation, and then maintenance, of "core" networks of economically-important roads. This policy, although a rational use of scarce government resources, has led to the neglect of many rural roads, and put rural tracks and paths very low on the priority list for improvement.

The majority of rural communities in developing countries are, therefore, reliant for access on paths, tracks or rural roads which are largely unengineered and, mostly, not maintained. Rough and narrow roads and tracks not only increase travel time and cost, but also prevent or discourage their use by traders and transport operators due to the risks of getting stuck or of damaging their vehicles.

Most tropical and sub-tropical countries are characterised by wet seasons extending over several months during which earth roads become impassable, and footpaths become slippery and dangerous. Unfortunately, these are also the seasons of the year when agricultural activity is often at its highest and farmers most need access to their fields, supplies of inputs, and markets.

Paths and tracks in steep terrain can present safety problems due both to the difficulty of negotiating the path or track itself, and due to the risk of landslides and falling rocks and stones. River crossings are a further hazard. The lack of bridges or safe crossing points is often the main reason for rural communities
becoming totally cut off for periods of time in the monsoon or rainy seasons.

To overcome the worst of these problems, the wholesale upgrading of a path or rural road is rarely necessary. Spot improvement of bottlenecks in the network is less expensive, faster to implement, and more cost-effective. Building or improving river crossings, in particular, can dramatically affect access for rural communities. The trail bridge building programme and earlier suspension bridge building programme in Nepal have been responsible for significantly changing the level of access to remote villages in the hills.

The major problem with rural infrastructure is that central government can rarely afford to carry out the necessary improvements and rural communities either do not have the capacity or the technical knowledge to do it themselves.

In Makete in southern Tanzania, where a multi-faceted rural transport project was carried out, the improvement of footpaths is remembered by villagers as one of the most useful benefits of the project. Several footpaths connected villages in Makete at the top of the escarpment with important local markets at the foot of the escarpment. There were no roads, and it would have been prohibitively expensive to build roads in the steep terrain of the area. Instead the project carried out spot improvement of the footpaths. These improvements reduced journey times and increased safety on the paths generating more foot traffic and greater volumes of goods carried as a result. (16)

The rural access programme in Kenya successfully constructed 8,000 km of gravel roads to provide improved access to high agricultural potential areas of the country. These roads were built labour-intensively using local paid labour, and subsequently maintained using some of the same labour force. Although not built for high-speed traffic, this network of small roads provides reliable, year-round access, even in areas of heavy rainfall.

The economic returns for local rural infrastructure construction tends to be high, particularly when opening up access to an area. Studies in Ghana showed that it was 140 times more beneficial to bring vehicular access 5 km closer to a village previously dependent on head loading, than to carry out the improvement to 5 km of a road which already permitted vehicular access. Because the investment costs of building rural infrastructure are relatively low and the benefits from change in access relatively high, it is not unusual to demonstrate such high benefit/cost ratios.

4.3 Means of transport

The predominant mode of transport in rural areas, particularly for "internal" trips, is walking carrying loads on head, back or shoulders. Typically 70 to 80% of trips are by walking. In the Indonesian Study (A2) 90% of trips were by walking accounting for 38% of distance travelled, and even in the Indian Study (A3) where vehicles were widely used, 67% of trips of less than 2km were by walking. The load that can be carried is typically 25 to 30 kg so that multi-trips are necessary for many activities such as collecting water and transporting crops. This imposes severe burdens in time and effort on rural households, which are clearly illustrated in Figure 2.2.

The transport burden can be substantially reduced by use of even simple vehicles. For example, a wheelbarrow can move three times the load that can be carried for the same input of time and effort, and a handcart up to 8 times. However, vehicles tend to be used only if they can be seen to pay for themselves and are generally only introduced when the movement of produce for marketing becomes unmanageable by human porterage. The study in Kenya (A1) illustrates a rather unusual case in which donkey carts have been adopted to transport water but this is primarily to transport extra water for livestock which are important earners of income in the study area. In households which do not own livestock water is mainly transported by headloading.

Studies of transport patterns outlined in Chapter 2 show that rural transport comprises mainly short trips (less than 10 km) in and around the village, carrying relatively small loads, often on earth paths and tracks. Few conventional motorised vehicles are available in rural areas, and in any case a combination
of low incomes and limited infrastructure make them largely unaffordable and unsuitable. Improvements in means of transport for rural households therefore lie in the lower-cost range of what are termed "intermediate means of transport, IMT" i.e. intermediate between human porterage and conventional motorised vehicles. This situation seems likely to continue for the foreseeable future for most rural communities.

Details of the range of IMT are shown in Table 4.1. They range from animal-drawn sledges, which are usually made by the farmer and cost virtually nothing, up to single-axle tractor-trailers which cost about 25% of the cost of a pick-up. The initial costs shown are considered typical average costs of reasonable quality devices but will vary from country to country depending on such factors as availability and cost of materials, cost of labour and government policy on import of components and items such as bicycles and motorcycles. The main variations in initial costs will be for items which are made locally. For instance, in particularly poor areas crude wheelbarrows and handcarts may be made at very low cost from wood and scrap materials. An ox-drawn cart using a scrap car axle costs around $150 to $200 in Kenya and $200 to £300 in Zimbabwe where scrap axles are less readily available, whilst factory-made carts cost about $400 in Zimbabwe and over $500 in Malawi (18).

Although affordability, and therefore initial cost, is usually a ruling criterion in the selection of an IMT, operating costs should also be considered because of their effect on net income received from marketing of produce and on the ability of the owner to afford repairs and to keep the IMT operational. The latter factor can be a serious problem for farmers since their income tends to be concentrated in the period following harvest so that if breakdowns occur at other times of the year the IMT may be out of operation for many months. This showed up in household surveys in Zambia where 30 to 40% of bicycles were out of service because of the high cost of spare parts and repairs (19).

Estimates of the operating costs of the range of IMT are shown in Table 4.2.

This considers two scenarios: i) if the IMT is used for an average of 2 hours per day, i.e. 500 hrs per year; ii) if the IMT is used only for transporting agricultural produce, including marketing, assuming a typical average task of 100 tonne km per year. Little field data is available on the running costs of IMT, particularly animal-based types, and the values in the table rely on a number of assumptions which are considered "reasonable." Nevertheless, the table is considered to give a realistic comparison of operating costs of the different IMT and to illustrate a number of important trends:

- cost effectiveness, measured in terms of cost per tonne km, depends on operating cost and load capacity, and therefore on whether the IMT operates at full or part load. For instance, observations suggest that ox-carts seldom operate at full load so that actual cost per tonne km will be considerably higher than that shown. It is possible that a smaller cart, such as a single donkey cart, is better matched to the loads that have to be transported by many small farmers and so would be more cost-effective.

- a similar conclusion might also be drawn by comparing the capacity of the IMT with the annual household transport need. Chapter 2 suggests that 100 tonne km is typical for an average size household. Even operating at half load, an ox-cart can complete this in 72 hours so that it may be sitting idle for the majority of the time. From the table it can be seen that if the ox-cart is only used for transporting 100 tonne km per year its operating costs are significantly higher than for a donkey cart. To make full use of its capacity and to be cost-effective the ox-cart needs to be hired out as much as possible. If therefore has important assets in being able to move large amounts of goods in a few trips, which is useful at harvest, and in providing potential to earn considerable income from hiring.

- the need to operate near full capacity becomes more important as the cost of the vehicle increases. The cost of using a single-axle tractor trailer at household level is seen to be extremely high. (However, in Asian countries it is also used for cultivation and several other agricultural activities which make it much more cost-effective). Even if used to its full capacity in transport operations (around 10,000 tonne km per year) its cost per tonne km is significantly higher than for an ox-cart. Its main potential as a purely transport vehicle is therefore seen to
<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Typical Load (kg)</th>
<th>Average Speed (km/hr)</th>
<th>Daily Range (km)</th>
<th>Transport Capacity (tonne km/hr)</th>
<th>Typical Initial Cost ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human Carrying</td>
<td>25 to 30</td>
<td>4 to 5</td>
<td>15 to 20</td>
<td>0.12</td>
<td>-</td>
</tr>
<tr>
<td>Wheelbarrow</td>
<td>90</td>
<td>3 to 4</td>
<td>5 to 6</td>
<td>0.31</td>
<td>60</td>
</tr>
<tr>
<td>Handcart (1 Person)</td>
<td>200</td>
<td>3 to 4</td>
<td>10 - 12</td>
<td>0.70</td>
<td>50 to 100</td>
</tr>
<tr>
<td>Cycle with Carrier</td>
<td>50</td>
<td>10</td>
<td>40 - 50</td>
<td>0.50</td>
<td>100</td>
</tr>
<tr>
<td>Cycle Trailer</td>
<td>150</td>
<td>8</td>
<td>30 - 40</td>
<td>1.20</td>
<td>70 to 100</td>
</tr>
<tr>
<td>Pack Donkey</td>
<td>50 - 80</td>
<td>4 to 5</td>
<td>20</td>
<td>0.3</td>
<td>80</td>
</tr>
<tr>
<td>Ox-Drawn Sledge (2 oxen)</td>
<td>250</td>
<td>2 to 3</td>
<td>15</td>
<td>0.63</td>
<td>10</td>
</tr>
<tr>
<td>Donkey Cart (1 donkey)</td>
<td>300</td>
<td>4 to 5</td>
<td>20</td>
<td>1.35</td>
<td>150 to 200</td>
</tr>
<tr>
<td>Ox-Cart (2 oxen)</td>
<td>800</td>
<td>3 to 4</td>
<td>20</td>
<td>2.8</td>
<td>250 to 350</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>200</td>
<td>40</td>
<td>40</td>
<td>4.0</td>
<td>2000</td>
</tr>
<tr>
<td>Motorcycle Trailer</td>
<td>300</td>
<td>30</td>
<td>40</td>
<td>6</td>
<td>400</td>
</tr>
<tr>
<td>Single-axle Tractor Trailer</td>
<td>800</td>
<td>10</td>
<td>40</td>
<td>8</td>
<td>3000</td>
</tr>
</tbody>
</table>

**Note:** In the case of animal-drawn carts and sledge, it is assumed that the animals are used as an extension of draught agricultural work, so that their costs are not included. A cost of $60 is assumed for a pack donkey, which is only used in transport work.
<table>
<thead>
<tr>
<th>Mode</th>
<th>Life (yr)</th>
<th>Depreciation ($/yr)</th>
<th>Operating cost for 500 hrs per year ($)</th>
<th>Cost of transporting 100 tonne.km per year ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Running</td>
<td>Total</td>
</tr>
<tr>
<td>Human Carrying</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wheelbarrow</td>
<td>8</td>
<td>11.20</td>
<td>10.00</td>
<td>21.20</td>
</tr>
<tr>
<td>Handcart</td>
<td>15</td>
<td>9.90</td>
<td>10.00</td>
<td>19.90</td>
</tr>
<tr>
<td>Bicycle &amp; Trailer</td>
<td>10</td>
<td>30.20</td>
<td>48.00</td>
<td>78.20</td>
</tr>
<tr>
<td>Pack Donkey</td>
<td>15</td>
<td>10.50</td>
<td>30.00</td>
<td>40.50</td>
</tr>
<tr>
<td>Ox-drawn Sledge</td>
<td>2</td>
<td>5.70</td>
<td>30.00</td>
<td>35.70</td>
</tr>
<tr>
<td>Donkey Cart</td>
<td>15</td>
<td>23.00</td>
<td>31.30</td>
<td>54.30</td>
</tr>
<tr>
<td>Ox-Cart</td>
<td>15</td>
<td>39.40</td>
<td>75.00</td>
<td>114.40</td>
</tr>
<tr>
<td>Single-axle Tractor-Trailer</td>
<td>10</td>
<td>488.00</td>
<td>550.00</td>
<td>1038.00</td>
</tr>
</tbody>
</table>

Notes:
1. Depreciation is based on interest rate of 10%.
2. Running costs comprise maintenance costs for vehicles and animals plus fuel costs in the case of the single-axle tractor.
3. The operating cost per ton.km is based on the IMT operating at full capacity. The same assumption is made in calculating the time needed to transport the equivalent of 100 tonne.km.
4. The vehicle operating cost to transport 100 tonne.km is based on annual depreciation plus a proportion of the running cost for 500 hours per year, assuming the latter is linearly proportional to time taken.
5. Labour cost is based on time taken costing at $1 per 8 hr day.
6. Annual maintenance costs for vehicles are based on field experience or where this is not available, 15% of initial cost.
7. The maintenance cost of animals are very difficult to estimate as the vary greatly with conditions and degree of care with which they are treated. Cost of food is particularly difficult - are the animals assumed to obtain all their food from free grazing or is supplementary fodder needed? The following assumptions were made:

- **Pack Donkey**: It is assumed that load-carrying is its only role. Some costs are available from a study in Nigeria (2G). This gives the following data - vet bills $5; harness repair $5; fodder $85. The fodder cost seems high and has been reduced to $20.00 in the table.
- **Ox-drawn Sledge**: It is assumed they are also used in cultivation so that transport costs are for additional maintenance. $10 is assumed for a donkey and $15 for oxen.

30
be to provide transport services over medium distances (see Section 4.4).

- low-cost, low capacity IMT, such as wheelbarrows, seem to be more cost effective for transport needs of around 100 tonne km per year. However, if the extra time taken is considered and an opportunity cost for labour included, they became much less cost-effective. Also an important asset needed at harvest time is to move large quantities of produce in a short time. Taking these factors into account, handcarts still appear to offer good potential. At present their main use is in urban areas and they are seldom found in rural areas. This may be partly due to constraints of infrastructure, since they need a reasonably wide track, about 1m, but there is probably considerable potential for their greater exploitation in rural areas.

Selection of IMT

In addition to affordability, i.e initial and operating costs, a number of other factors have to be considered in selecting appropriate IMT for particular conditions and needs. A selection guide is shown in Figure 4.1 which considers appropriateness for physical conditions, topography and infrastructure.

- Topography is the entry point since it governs the selection between wheeled and non-wheeled IMT. Wheeled vehicles are not generally suitable to hilly terrain, for example the use of bicycles is particularly sensitive to hills - this is the reason for their very limited use in the region of the Indonesian Study (A2). On rough, hilly tracks the best option are pack animals, donkeys or mules, but if these are not available then walking with an appropriate form of load-carrying device such as a back frame (21). If better and wider tracks are available then animal-drawn sledges are a possibility since their high ground drag provides good control on slopes. However, loads will be low and careful consideration needs to be given to their impact on damage and erosion of tracks. Handcarts and animal-drawn carts are possible options for less steep, well maintained tracks, but they must have effective braking.

- Infrastructure, particularly widths of tracks, also has a major bearing on appropriateness. Access is often along narrow walking tracks and in these cases only single-track IMT are suitable - wheelbarrows, bicycles and motorcycles. On wider tracks the nature of the surface is the determining factor. For instance, if tracks have marked wheel ruts from use of heavy vehicles then either single-track IMT or carts with track widths matching the ruts will be most appropriate. Cycle trailers will be very difficult to use in these situations because the bicycle must be ridden between the wheel ruts.

The characteristics of IMT with respect to costs and appropriateness are summarised as follows:

Wheelbarrows & handcarts:

these are at the low end of the cost range. They involve similar levels of effort as human carrying but to greater effect in transporting much larger loads. Wheelbarrows can be used on narrow tracks but are tiring on the arms and are really only suited to quite short trips. A "Chinese" style wheelbarrow with the load more directly over the wheel is suited to longer trips but it is very difficult to balance and attempts to introduce it more widely have not been successful.

Most handcarts are single-axle with the load balanced over the axle so that the main human effort goes into propulsion. Loads up to 200 kg can be moved by a single operator on reasonably flat ground, i.e. over twice the capacity of a wheelbarrow. They are easily operated by more than one person which is an advantage for overcoming obstacles or negotiating steep slopes. As indicated above, it is considered that there is good potential for greater use of handcarts in rural areas.

Bicycles:

the bicycle is the most efficient form of human powered transport. It is the only readily available non-motorised IMT which gives significant increases in speed
Figure 4.1: Decision-Making Based on Topography and Infrastructure (from Reference 31)

<table>
<thead>
<tr>
<th>TOPOGRAPHY</th>
<th>INFRASTRUCTURE</th>
<th>MEANS OF TRANSPORT</th>
<th>LOAD CAPACITY (kg)</th>
<th>COST INDEX</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hilly</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Walking</td>
<td>25-40</td>
<td>1-2</td>
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<td></td>
<td></td>
<td>肩扛</td>
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<td></td>
<td></td>
<td>Forkanimals</td>
<td>20-40</td>
<td>1-2</td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>HorseCarts</td>
<td>50-100</td>
<td>3-5</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>AnimalShostr</td>
<td>50-100</td>
<td>3-5</td>
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<tr>
<td></td>
<td></td>
<td>AnimalCars</td>
<td>100-200</td>
<td>100/150</td>
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<tr>
<td></td>
<td></td>
<td>Narrow rough tracks</td>
<td>50-100</td>
<td>3-4</td>
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<tr>
<td></td>
<td></td>
<td>Motorcycles</td>
<td>100</td>
<td>20/25</td>
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<tr>
<td></td>
<td></td>
<td>HandCarts</td>
<td>50-100</td>
<td>3-5</td>
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<tr>
<td></td>
<td></td>
<td>Bicycle-cargos, pedals, handbars</td>
<td>50-100</td>
<td>3-5</td>
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<tr>
<td>Rolling or Flat</td>
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<td></td>
<td></td>
<td>Handcarts</td>
<td>300-500</td>
<td>150/300</td>
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<td></td>
<td></td>
<td>Motorcycles</td>
<td>300-500</td>
<td>150/300</td>
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<tr>
<td></td>
<td></td>
<td>Motorcycles</td>
<td>250</td>
<td>3-5</td>
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<td></td>
<td></td>
<td>Motorcycles</td>
<td>300</td>
<td>3-5</td>
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</table>

*NB: Cost index is a multiple of the lowest cost CNVs such as truckers and jinete.

Legend:
- Black Basket: Baskets used for small loads, often carried by hand.
- Shoulder Bag: Small carrying bag used for personal or small loads.
- Bicycle: Used for personal or small loads, especially in hilly or rough terrain.
- Animal Cart: Used for transporting animals, typically on narrow rough tracks.
- Animal Cart: Used for transporting animals, typically on narrow rough tracks.
- Narrow rough tracks: Tracks suitable for bicycles but not for motorized vehicles.
- Medium rough tracks: Tracks suitable for motorized vehicles but not for large trucks.
- Wide smooth tracks: Tracks suitable for large vehicles like trucks.

Cost Index: The cost index is a multiplier for different costs, such as transport and infrastructure.
over walking, reducing travel times and increasing comfortable range of travel. It therefore greatly increases personal mobility. Loads of up to 60 kg can be carried on a carrier or on panniers (21) when the cycle is ridden, and considerably higher loads if the bicycle is pushed. Even in this mode the bicycle is an effective means of transport since substantial loads can be moved over narrow tracks on one leg of a journey and the bicycle ridden on the return leg.

A trailer significantly increases the load-carrying capacity of a bicycle but it requires a track at least 1 m wide. Although a trailer involves a significant additional investment, it increases the cost-effectiveness of the bicycle as a load-carrying IMT (Table 4.2).

Pack animals: the most widely used animal is the donkey, but horses and camels are also used in specific locations. Pack donkeys are considered to be hardy and to be able to "live off the land". They are particularly suited to transporting loads on hilly tracks and in arid areas. Loads should be limited to 1/3 of the body weight and properly designed panniers and harnesses are needed to avoid discomfort and injury to the donkey (21).

Operating costs can vary greatly depending on local availability of donkeys and experience in their use. Even at a relatively modest initial cost of $60, the cost-effectiveness of a pack donkey used solely for transport is low compared to other IMT (Table 4.2). In an area where they are traditionally used they are a useful transport resource, but if they are not traditionally used, introduction can involve substantial inputs in training the local communities in care and use of the donkeys.

Animal drawn sledge: this is the lowest-cost form of IMT, often being made by the farmer from a forked tree trunk. They are a very useful form of transport for poor farmers who own animals but their use may need to be limited to off-road conditions because of damage and erosion they may cause to access roads and tracks. Their primary use therefore tends to be between the homestead and the fields.

Animal-drawn carts: good quality carts are at the upper price range of non-motorised IMT, but very low-cost crude carts — often with wheels cut and shaped from tree trunks — are sometimes used advantageously in particularly poor areas. If the animals are used as an extension to draught activities in agriculture, carts are a cost-effective form of transport — providing good utilisation rates are achieved. It is possible that ox-carts have excess load-carrying capacity for average-size households and that substantial hiring out of carts is needed to achieve reasonable utilisation. Lower-capacity, cheaper carts drawn by donkeys or a single ox may be better matched to the transport needs of many rural households.

Low-cost, motorised IMT: these represent a substantial jump in operating speed and cost from the non-motorised modes outlined above. The common modes are motorcycle-based and single-axle tractors. Even at high utilisation rates their operating costs are significantly higher than animal-drawn carts and it is unlikely that their use can be justified for "internal" rural transport unless they are also used extensively in other agricultural activities (as are the single-axle tractors in Asia) or in providing transport services to the community. Their speed and load capacity appear to provide good potential for this latter use; i.e. low-cost transport services providing access to external facilities and linking up with more
Role of IMT in improving rural access

The main advantage of IMT is in reducing the time and effort involved in rural travel and transport as compared with human porterage. Wheelbarrows, carts and trailers improve access by greatly reducing the number of trips needed to transport agricultural crops or other materials thus releasing substantial blocks of time which can be used in other activities. The potential time savings are clearly shown in Table 4.2. Consequently they also provide a large increase in load-carrying capacity which may encourage households to extend cultivation and production of crops.

In the case of bicycles, improved access is also achieved through greater speeds which reduce travel times and make longer trips feasible. The latter is particularly important in providing access to work opportunities, health facilities and more distant markets.

The main role of IMT is in moving agricultural inputs and produce in and around the village, grain to the mill and produce to markets and collection points that are within a reasonable distance. Although they could often be used to save considerable time in subsistence activities such as collecting water and firewood, their use in these activities is limited. For example the Kenya Study (A1) although over 40% of households own donkey carts, around 87% of firewood is transported by women by headloading. This is common practice, particularly in SSA, which appears to result from traditional gender roles and the failure of men, who usually control the use of IMT, to recognise the opportunity costs of women's time, even where it might be used to help in increasing production of marketable crops.

Although the potential role of IMT in improving rural accessibility is clear to see, much of the evidence of actual benefits is circumstantial. For example, the suggestion discussed in Section 2.5 that time saving from use of IMT in Aurora has enabled households to produce surplus crops for marketing. The benefits are also indicated by the fact that many rural households are prepared to invest several months of income in purchasing IMT, presumably because of the economic benefits they gain from improved access to markets and other facilities.

4.4 Transport services

Transport services involve the movement of passengers or goods for a fee by an operator working as a business or employee of a business. They normally operate on popular routes where traffic levels are high enough for the services to be economical, for instance linking villages to markets or a rural centre. However, some of the lower-capacity modes, such as bicycles or motorcycle-based vehicles, are able to provide for more individual needs of a more "door to door" type service. These modes may also be suitable for providing a village transport service, linking the village with a range of facilities. For example, a motorcycle and trailer introduced in a pilot project by Intermediate Technology in Sri Lanka has operated successfully for nearly two years carrying villagers to market, health clinic and hospital and children to school. Larger capacity modes need relatively large loads to operate economically. They are therefore less flexible and tend to operate on fixed routes between specific collection and drop-off points.

Transport services are particularly important for providing access to "external" facilities. The transport modes used therefore need to be suitable for longer distance trips than the generally non-motorised modes used for short "internal" transport. A range of available modes is compared in Table 4.3 in terms of operating cost per passenger km (p. km) and operating cost per tonne km (t. km). The operating costs are estimated from data presented in Table A.1 of Appendix 1 which is based on data taken from Reference 22 and from field experience. Average speeds and running costs (for fuel and maintenance) are dependent on road/track conditions. The data used is considered appropriate for typical average earth or gravel roads. Operating costs will be higher for roads in poor condition.
Factors affecting operating costs (see Table 4.3)

The operating costs are made up of two components:

1. Fixed costs - depreciation, taxes, insurance, operator cost and overheads
2. Running costs - fuel and maintenance

The running cost component for a trip is mainly dependent on trip length although the load carried will also have some secondary effect. The fixed cost component is dependent on the number of trips per year i.e. availability and utilisation.

Availability of 100% is assumed as 8 hours per day for 250 days per year. If availability is reduced to 80% by breakdowns or other factors then the fixed cost component will increase by about 25% (depending on whether operator costs are still assigned to the vehicle when it is not operational).

Utilisation is the time the vehicle is used when it is available and is dependent on "standing" or non-operational time. In the table it is assumed that there is a full-time demand for the service so that utilisation is governed by loading and unloading times. Utilisation is therefore lower for larger vehicles, particularly on short trips. For example the 7 tonne truck has a trip time of just over 2 hours for the 5km trip (1 hour load + 10 minutes travel + 1 hour unload) compared with a motor-cycle trailer trip time of 35 minutes (10 minutes load + 15 minutes travel + 10 minutes unload). Larger capacity vehicles are therefore more economical on longer trips where their utilisation is higher.

The operating costs per passenger km and per tonne.km are for full-capacity loads on all trips. If part-loads are carried or return trips are empty then the unit costs per (p.km) and (t.km) will be increased almost proportionately i.e. if average loads are 50% of capacity then unit costs will be almost double (the running costs will in fact be somewhat lower).

It is considered that the table gives a realistic comparison of operating costs of the different modes but the actual level of costs and changes is likely to vary somewhat for different locations. Reference 23 quotes the following comparison for three countries for operating conditions similar to the 10km trip length shown in Table 4.3.

- Operating cost (US cents per ton km) for single-axle tractor trailers -
  Thailand 32c; Zimbabwe 18c; Ghana 38c

- Operating cost (US cents per ton km) for pick-up -
  Thailand 33c; Zimbabwe 25c

Reference (24) states that operating costs for motorised transport services are generally higher in African countries than in Asian countries, sometimes by a factor of 2 or more. It is thought that this may be partly due to lower levels of preventative maintenance in Africa leading to higher repair costs.

Comments on transport modes

Bicycle: although the initial cost is much lower than for other modes, the bicycle's unit operating costs are the highest due to its low carrying capacity. Its main advantage is affordability which enables poorer persons to earn an income by obtaining a bicycle to operate transport services, for instance the bicycle-taxi which are used in parts of Kenya and Uganda (25). A bicycle-taxi can also offer a more individual service, for instance taking persons to their village or home. The unit operating costs are substantially reduced by adding a trailer which more than doubles carrying-capacity.
Table 4.3: Comparison of operating costs of vehicles used for rural transport services

<table>
<thead>
<tr>
<th>Model</th>
<th>Average Speed (km/h)</th>
<th>Load (kg)</th>
<th>Number of Passengers</th>
<th>Assumed Number of Trips per Day (5)</th>
<th>Cost (in terms of trip) for various trip lengths (3)</th>
<th>Cost (in terms of 10 trips) for various trip lengths (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>km, 10km, 20km</td>
<td>km, 10km, 20km</td>
<td>km, 10km, 20km</td>
</tr>
<tr>
<td>Bicycle</td>
<td>10</td>
<td>60</td>
<td>1</td>
<td>0 5 7</td>
<td>1.2 2.4 3.6</td>
<td>2.4 4.8 7.2</td>
</tr>
<tr>
<td>Motorcycle, sidecar or sidecar</td>
<td>20</td>
<td>250</td>
<td>3</td>
<td>4 7 9 2</td>
<td>3.3 6.6 10.8</td>
<td>6.6 13.2 21.6</td>
</tr>
<tr>
<td>Single-wheeler</td>
<td>40</td>
<td>500</td>
<td>6</td>
<td>1 3 5 4</td>
<td>6.4 12.8 21.2</td>
<td>12.8 25.6 41.4</td>
</tr>
<tr>
<td>Two-wheeler</td>
<td>80</td>
<td>1000</td>
<td>8</td>
<td>5 7 10 4</td>
<td>10.4 20.8 34.4</td>
<td>20.8 41.6 69.6</td>
</tr>
<tr>
<td>Three-wheeler</td>
<td>100</td>
<td>2000</td>
<td>10</td>
<td>10 12 14 2</td>
<td>12.8 25.6 41.6</td>
<td>25.6 51.2 82.4</td>
</tr>
<tr>
<td>Four-wheeler</td>
<td>150</td>
<td>3000</td>
<td>15</td>
<td>15 18 22 3</td>
<td>17.6 35.2 56.4</td>
<td>35.2 70.4 112</td>
</tr>
</tbody>
</table>

Note: 1. The number of trips per day was derived from the average speed and a loading and unloading time which varies from 10 minutes for a motorcycle to 3 hours for a 7-tonne truck. The 10% load factor is assumed.

2. The operating costs are based on the data presented in Table A1 in Appendix 1 as follows:
   Operating cost per trip = Fixed cost per trip + (running costs x number of trips)

3. The operating costs are based on regular operation over 5 hours per day for 250 days per year. It includes all costs other than those for depreciation, taxes, and overheads. Table 10.8 in Reference (2) includes these costs for vehicles of different types and capacities. The operating costs per day will increase slightly for vehicles that are used for more than 100 trips per day.

4. The operating costs are based on the number of trips per day as presented in Reference (2)
Motorcycle: unit operating costs are relatively high because of limited carrying capacity. The capacities assumed are conservative - some motorcycle-based vehicles in the Philippines carry up to 15 passengers (Annex 4) and it is reported that trailers in Cambodia and Vietnam carry over 500 kg. However, motorcycle-based vehicles have advantages of reasonably low initial cost and good speed which makes trips up to 50km feasible. They are considered particularly suitable for providing general transport services for a village where they could give convenient access to distant facilities such as health clinics, hospitals, doctors and rural centres.

Good examples of motorcycle-based transport services and the benefits they provide in improving access at village level are the sidecar types used widely in the Philippines (Annex 4) and 3-wheelers used in Gujurat State of India (28).

Single-axle Tractor-trailer: these are widely used for providing transport services in many Asian countries but are little used in African countries. Although rather slow, they have a good carrying capacity which gives them the lowest unit operating costs for shorter trips. Although they are not suitable for the same range of agricultural applications in Africa as in Asia it is considered that they could have good potential purely in transport use, providing transport services at village level and to facilities within about a 10 to 15 km range.

Pick-ups: these represent a significant jump in initial cost and in speed of operation. They are most competitive in the medium trip range of 10 - 15 km. They are generally more suited to rural needs than larger trucks since their lower load capacity is more compatible with the relatively small loads that have to be transported, leading to efficient operation at near full capacity.

Trucks: where trucks provide rural transport services they are usually part of a marketing board operation collecting cash crops from collection points or an urban-based business collecting produce from rural areas to sell in the urban market. An example of the latter are the "mammy" wagons that operate in Ghana. The operating costs of larger trucks are high for short trips because of relatively long loading and unloading times. Also their large capacities are often not compatible with the needs of rural communities and in order to operate near full capacity their service may be infrequent so that they are mainly suitable to moving bulky, non-perishable goods which can be stored till full loads are available.

Buses: to be cost-effective standard buses need to operate near full capacity on high-traffic routes. They therefore tend to operate on main roads linking population centres and provide rural people with access to these centres, although villagers more remote from the highway may have to travel several km to the nearest pick-up point. Standard buses can seldom operate affordable services to villages because of limited passenger numbers and poor infrastructure which increase operating costs. If access roads are reasonable than mini-buses may be able to operate cost-effective services to villages, for example the Matatus in Kenya and Jeenies in the Philippines, but fares are likely to be higher than for alternative lower-cost options, namely motorcycle-based vehicles and single-axle tractor-trailers. These latter two modes appear to offer the most appropriate options for affordable transport services at village level.

The "Access" role of transport services

Access to external markets is essential for agricultural development. The major demand, and hence best price, for agricultural produce, is in the main population centres where people tend to buy rather than grow their food. Also farmers that grow cash crops need access to "external" depots or collection points. Lack of effective transport services significantly constraints the opportunities that households can gain from access to these facilities, imposing severe penalties through lengthy travel times,
substantially restricting the volume of produce that can be transported and sometimes forcing farmers
to sell at low prices to traders at the farm gate. For example, in Ghana where transport services are
quite limited, farmers often sell to the “mammy” wagons which buy up produce in the village. The
produce may pass through as many as 5 intermediaries so that the price that the farmer receives is a
fraction of the market price (24). In general it is estimated that because of lack of effective transport
services, farmers in Africa receive on average 30 to 50% of the final value of their produce (after taking
out intermediary costs and/or transportation costs) whereas in Asia, where there are generally better
transport services, farmers receive an average of 70 to 85% of the value of their produce.

The benefits of transport services in providing good access to markets are amply demonstrated by the
advantages of living close to major population centres or main roads. Farmers in these areas can often
earn considerably in excess of average incomes. An added advantage is that persons can commute
on transport services from these areas into the urban centre for non-agricultural work thus further raising
the general level of incomes in the area which has flow-on benefits to the community.

In the Kenyan Study (A1) the income of farmers in the study area which is close to Nairobi, is
significantly higher than the national average and the larger plots, earning greater income, tend to be
close to the main access route. About 20% of the population of the study area commutes to work in
Nairobi.

The availability of effective transport services is particularly important for marketing perishable goods
such as vegetables. These need to be moved in relatively small lots at the correct time. Large capacity
trucks are not effective in meeting this need and often buses play an important role in moving small
loads of this nature, for instance see the transport studies in both Kenya (A1) and Indonesia (A2). Buses
are also widely used in transporting vegetables into the markets in Harare in Zimbabwe from a wide area
around the city.

In general trucks tend not to be well matched to the external transport needs of rural households which
are typically for moving relatively small loads over medium distances. In Asia, effective transport
services are often provided by a range of smaller vehicles, based on motorcycles or small diesel-engines,
which are better matched to the needs of the rural communities and provide services right into
the villages. These generally do not exist in Africa and the only option between walking and large trucks
are buses. However, these usually operate only on main routes so that households may have to
transport their produce over considerable distances to pick up the bus. The lack of effective transport
services and the difficulties of getting access to those that do exist are likely to be significant constraints
on increasing agricultural production. There is little point in growing more crops if getting them to market
involves major difficulties and if the cost of transport absorbs much of the income generated. These are
particular problems in Sub-Saharan Africa (15).

In addition to providing access to external markets and work opportunities, transport services are
needed to provide access to health, education and social facilities. As outlined in Chapter 2, some basic
health care is available at village level but doctors and hospitals are generally located in the urban
centres, so that access may involve trips up to 100 km. Primary education is widely available at village
level in many countries, but secondary education tends to be available only in larger population centres.
Enrollment in secondary education is low in most developing countries, often less than 20%. An
educated work force is an essential ingredient of development and improved access to secondary
education needs to be a high priority, although limited facilities is also a major constraint. Intermediate
motorised transport services operating down to village level and linking up with main bus routes may
provide potential to significantly improve access to health, education and social facilities (A4).
Chapter 2 has outlined the characteristics of rural travel and transport and identified the primary or basic need as access of rural households to facilities for subsistence, economic, health, education and social and business requirements. Chapter 4 has discussed the factors which affect the level of access that households have to these facilities, namely: location of the facility, infrastructure providing access to the facility, means of transport and transport services. This chapter discusses the interaction of these factors and, because of the strong inter-relationships, the need for an integrated approach to accessibility planning.

5.1 Inter-action of factors which affect access

The level of access to a facility is primarily measured by the average time needed to travel to the facility. However, if a means of transport is used then the cost of travelling to the facility might also be included, particularly if transport of goods for economic reasons is involved. Level of access would then be judged by some compromise between time and cost which is acceptable to the household.

The time taken to travel from the homestead to a facility is determined by distance, the nature of the infrastructure and terrain (good, poor, hilly, flat etc ...), the means of transport used and to some extent whether a load is carried (this ignores any waiting that might be involved at blockages, ferries etc ...). The same factors will also determine cost but in a more complex manner. The distance to the facility is determined by its location and the infrastructure which is available to provide access. The factors - location of facility, infrastructure and means of transport (or transport services) - are clearly inter-related in determining the level of access to a facility. It is therefore essential that the factors are not considered in isolation in accessibility planning. For instance:

- In planning the location or relocation of a facility, the infrastructure providing access for the catchment area must be considered in order to provide the best access for the maximum number of persons. As an example, consider the location of a primary school. The World Bank recommendation is that children should not have to travel more than 2.5 km to a primary school. However, if a circle is drawn on a map to define a catchment area which is within 2.5 km of the school, this does not consider the infrastructure which is available to provide access to the school. Some areas may not have direct access, possibly because of a natural barrier such as a stream or hill, and children may have to follow a roundabout route which is much more than 2.5 km long. It is therefore imperative to consider location of facilities and available infrastructure in conjunction. If infrastructure is too restrictive on the location of a facility then sections may need to be improved or new access routes developed.
the nature of the local infrastructure is one of the main factors in determining the means of transport which are appropriate for a particular area. (See Figure 4.1) For example, if many access routes are narrow tracks and paths then modes of transport such as wheelbarrows, bicycles and pack animals are appropriate but carts and trailers are not. If this imposes excessive constraints on movements of goods in the area then the infrastructure may need to be upgraded to allow wider vehicles to be used but it should only be upgraded to a level compatible with the types of vehicles which will be mainly used. It is not cost effective to over-design infrastructure to suit modes of transport such as motorised vehicles which will use it to only a limited extent. In fact it may be beneficial to discourage use by heavier vehicles which may cause undue damage to lower-cost infrastructure. The nature of the infrastructure and the means of transport which are appropriate for it are therefore very much independent.

5.2 A systems approach to accessibility planning

The above section has shown that the factors affecting rural access are interactive and cannot be considered in isolation. An integrated, system approach is therefore needed for effective accessibility planning to ensure that all the relevant factors and their inter-actions are properly taken into account. A hierarchical system needs to be developed which defines the internal systems which are the subject of the accessibility planning and the external system that influences them. This is illustrated in Figure 5.1.

The **internal** system should cover an appropriate geographical area encompassing inter-linked villages and matching the aims of the planning study. The distribution of households should be shown together with the internal facilities to which they need access. Main access routes should be marked together with brief notes on their nature and any particular features, including seasonal variations. Traffic flows of passengers and goods and a breakdown of means of transport used also need to be included.

The **external** system should cover all routes, major rural centres and facilities to which the internal system needs access or could benefit from access. Details of infrastructure, transport services, traffic flows of passengers and goods on main access routes and means of transport used should be noted.

Other factors and data relevant to the systems and their major elements may also be noted. For example, in relation to means of transport - types available, sources of supply, cost repair and maintenance facilities, availability for hire, levels of household income and credit sources. Development projects - present, planned and potential - which may influence access needs should be identified. This should include relevant plans of other authorities and government departments such as water, forestry and agriculture.

Formulating a system enables all the elements influencing accessibility needs and their inter-actions to be clearly identified and visualised. **Inter-action**, i.e., how changes in one element of the system relate to and impact on other elements can be described in clear concise statements. The inter-linking of the elements of the system can be illustrated in a flow diagram of the type shown in Figure 5.2.

The figure shows the flow of people and goods to meet their access needs both internal and external illustrating the infrastructure and transport requirements needed to provide effective access. Some of the features of the flow diagram are:
External System

Locate:
Markets
Resource centres
Schools
Health facilities
Grinding mills

Access routes

Key

○ Main centres
○ Smaller centres
• Villages
—— Primary road
—— Secondary road
—— Feeder road

Internal System

Locate:
Communities
Water sources
Fuel sources
Markets
Schools
Roads, paths, tracks

Key

○ Village centres
· Communities
—— Feeder roads
—— Paths and tracks

Figure 5.1: Integrated System for Access Planning
Figure 5.2: Flow diagram for systems approach to accessibility planning

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**Interactive Links**

1. compatibility of infrastructure and means of transport/transport services.
2. location of facility, infrastructure, level of access, time and cost.

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Potential for increased agricultural production.

% of available land cultivated

% possible increase in productivity.
in the internal system the means of transport will be primarily by walking or IMT. Trips are unlikely to exceed 10 km and the majority will probably be less than 5 km. IMT may be owned, hired or borrowed. Much of the infrastructure is likely to comprise paths and tracks.

means of transport to external facilities will depend on distance and infrastructure. Walking or IMT may be used for shorter distances, possibly up to 10 km although bicycles may be used up to 15 or 20 km. For longer trips transport services will be needed which may be local or external. Local transport services are likely to use low-cost, motorised IMT such as motorcycle-based vehicles and single-axle tractor-trailers. These services will also provide transport for non-owners of IMT over shorter distances. External transport services will be buses, trucks and pick-ups operating on the highway network and are likely to have their base in a major rural centre.

low-cost transport services have a limited range - single-axle tractor-trailers up to about 20 km and motorcycle-based vehicles up to about 40 km. For longer distances to external facilities the local transport services need to link up with external services. If the distance to the nearest external service is less than 10 km, links can also be made by walking or IMT. Transport services by trucks may operate infrequently and irregularly and for links to these services for non-perishable produce such as maize and potatoes it may be necessary to have a storage facility at the collection point on the highway.

the aims of planning for improved accessibility need to be clearly defined so that all relevant factors are included in the system. For instance, if the aim is economic development then opportunities, potential and improved access requirements need to be identified. This includes an assessment of the potential for increased agricultural production, the commitment of the community to this goal and the opportunities for marketing of increased output. The availability of effective transport services which provide an acceptable level of access in terms of time and cost is likely to have a large bearing on the commitment of farmers to increasing production. Since transport services need to operate at a high percentage of capacity to be cost-effective their use for other trip purposes may need to be explored, for instance opportunities for travelling to work in the rural centres accessed by the services.

Considerable effort is needed in initially needed to set up the system because of the substantial volume of local data which has to be collected and collated. However, once set up it provides a clear overall visualisation of access needs and problems in the area and a sound base for planning, ensuring that all relevant factors are included. The system can be readily updated to provide an ongoing means of recording the impact of interventions that have been made and for planning for further improvements in accessibility.
CHAPTER 6

GUIDELINES ON RURAL ACCESS PLANNING AND IMPLEMENTATION OF EFFECTIVE INTERVENTIONS

Chapter 5 has advocated an integrated systems approach to accessibility planning which gives an overview of access needs and problems in the area and ensures that all relevant factors and relationships are brought together in the planning process. It is recommended that the planning process should be kept as simple as possible using a mainly qualitative approach and avoiding complex analytical methods. A similar approach is advocated in the World Bank Approach Paper on Rural Transport Planning produced as part of the Sub-Saharan Africa Transport Policy Programme (12).

This chapter presents guidelines on the implementation of the planning process and also on effective interventions to improve accessibility which are selected and prioritised through the planning process.

6.1 Guidelines on rural access planning

The key aim of planning for rural development is to use limited resource in the most cost-effective manner, addressing priority needs and benefiting the maximum number of people. The planning process therefore needs to be based on reliable local data, to involve local communities in identification of needs and priorities, and to make realistic assessments of the likely impact and outputs of interventions. The overall objectives to be achieved from improved access should be clearly defined. The general guidelines to this approach are:

1. **Data Collection**: although general background data can be obtained from records, reliable, detailed data on access needs, travel patterns, loads moved, modes of transport and local infrastructure needs to be obtained from rural households. The most reliable data is obtained from household surveys (a summary of the methodology is given in Reference (8)) but this requires considerable resources and a less time-consuming method based on interviews with village groups and by informants has been found adequate (27).

2. **Community Participation**: it is important to involve rural communities in the identification of their access needs, problems and priorities as this motivates their cooperation in and commitment to subsequent interventions (28). This can be included in the collection of data to get general opinions from the community groups. Some novel ways have been used to identify priority needs, for instance allocation of 5 beans to the first priority, 4 to the second etc .... Further meetings should be held with villagers to discuss plans for interventions so that they are kept informed, plans can be modified to achieve general support and ongoing cooperation is ensured. Two approaches to community participation in the planning process are outlined in Boxes 1 and 2:

3. **Assessing likelihood of achieving goals**: investments to improve rural accessibility are generally aimed at promoting economic development (or poverty alleviation) through increased production and marketing of agricultural crops, or possibly by
improving access to work opportunities. Communities may place a high priority on improving access to social facilities but planners may either include them as secondary aims or anticipate that they will flow on from the primary aims. A realistic assessment therefore needs to be made of the potential for achieving the development aim. Physically this can be assessed by determining the percentage of arable land which is already cultivated and the levels of productivity which are being achieved and obtaining an expert opinion on the potential for increasing these levels and hence total agricultural output.

Box 1: Sri Lanka - Popular Participation in Identifying Rural Transport Problems

**Government Policy and Practice in Rural Transport**

Transport load in million tonne km

The Government of Sri Lanka has long been committed to the alleviation of rural poverty. Despite this, the National Transport Policy published in January 1992 made no reference to issues in rural transport. It rather put forward such general economic principles as that (a) transportation tariffs shall be related to the costs of providing the service, and (b) transport services and transport users shall not be subsidised by the government. It was this policy that led to the 'peoplisation' (in fact, mainly the privatisation) of bus and other transport services.

In parallel, rural planners at provincial and district levels focus principally on transport infrastructure - rural roads. They tend not to consider either the availability of the means of transport, including transport services to the poor or the importance of daily subsistence transport tasks, which in any case are often performed 'off-road'.

**Rural Transport Study**

Concerned at these apparent shortcomings and their possible effects on the rural poor, a group of researchers joined together in 1992/93 to undertake a study of rural transport in three divisional secretariat divisions - Hambantota, Akuressa and Dehiwila. The study team comprised staff of the international NGO the Intermediate Technology Development Group, the national Transport Policy Research Centre, the Rural Development Division of the then Ministry of Policy Planning and Implementation, and the Universities of Colombo and Ruhuna. It was financed partly by the British ODA and partly by the government itself. The methodology included extensive participation of village people themselves. However, this did not simply mean that researchers asked villagers for arbitrary 'wish-lists' of what they would like or would like to happen to improve their access (to goods, services, markets, schools and such like); to enhance their mobility; or to reduce the physical work-load to meet basic needs. Rather, the researchers tried to achieve consensus among the villagers on what were Participation in Access their priority concerns and what might be done to address them.

The results of the study focused on:

i) **physical infrastructure** - including the repair and rehabilitation of main roads, upgrading minor 'village roads', and installing permanent footbridges on key tracks and trails;

ii) **vehicles and services** - including the need for a wider range of intermediate means of transport (the bicycle being the most common, but having significant limitations in terms of distance and payload), and improvements in the frequency, regularity and affordability of bus services;

iii) **access to services** - including (in ranked order of importance) hospitals and other medical services, schools, banks, markets and legal services;

iv) **women and transport** - particularly the 'invisibility' of the major transport work-load developing onto women and the need for greater recognition of this in policy and among organisations and institutions seeking to address rural transport problems.

Prior to their finalisation, the results of the study were reviewed again in a series of workshops involving the concerned communities and local-level planners.
At the same time the potential to market these increased crops in markets which can be brought within reasonable access needs to be confirmed. However, the sustainable benefits that accrue from improvements in access will depend on the attitudes and reactions of the communities involved. Discussions with village groups should therefore attempt to realistically gauge what their reaction will be to planned improvements in access and whether predicted outputs are likely to be achieved.

4. **Monitoring:** It is important to monitor the impact of interventions so that lessons learnt can be fed back into the planning process and the planning (systems) model updated.

**Box 2 : Example of Community Planning in Kathekani, Kenya**

Kathekani is located mid-way between Nairobi and Mombasa. It is a semi-arid area with relatively undeveloped infrastructure. Although the earth access roads are generally in good condition, access to water and the district market is poor. Intermediate Technology, Kenya, have been working in the district since 1993 to address mobility and access needs of the community. The principal aim of the project is to demonstrate that local institutions have the capacity to develop and implement appropriate solutions to the access problems of their communities. The approach has been to develop a channel of communication between the villages and a district development committee. Transport committees have been established on a pilot basis in a number of villages which have expressed an interest to participate in the scheme. These seek opinions from their village on access needs and priorities, and representatives from the committees then pass these on to the district development committee. This is providing a structure for community participation in developing and implementing plans to improve accessibility in the district. The villages have a means of voicing their needs.

Priorities that have been established are for a local supply of low-cost, load-carrying IMT, particularly for transporting water, and a credit scheme that enables households to purchase the IMT. A local artisan has been trained to manufacture handcarts and a village management credit scheme established. Ten households have so far acquired handcarts and each of these is hiring out or loaning their carts to other households to spread the impact of the scheme.

Rural access planning using a model (system) based on reliable local data is similar to the approach developed by the ILO in studies in the Philippines (27). An example of the application of this approach in a project in Malawi is described in Box 3.
Box 3: MALAWI: District Level Accessibility Planning

Since 1991, the UNDP and the ILO have been assisting the Government of Malawi to implement a project which is aimed at increasing the accessibility of rural households.

Accessibility in rural Malawi is particularly poor. There is severe shortage of protected water supplies, classrooms and health centres. In addition the rural road network is limited and in poor condition. Rural transport services are nearly non-existent. The project set out to identify the access needs of groups of villages surrounding three growth centres. Using data collected at the household level, interventions were identified which would improve accessibility. These interventions ranged from the provision of IMTs through a credit system, the construction of footbridges and in situ kitchens and identifying the appropriate siting of services such as boreholes.

Significantly, IMTs were purchased in large numbers by the local population. The credit scheme has been effective and the repayment rate has been high. The IMTs purchased fell into two categories. Some, like ox-carts, had a clear economic benefit in terms of reducing transport costs and their hiring potential. Others, such as bicycles, had limited economic value but seem to have been purchased principally to reduce the burden of transport.

Over the life of the project it became clear that the approach had a wider potential than merely as a means of identifying project interventions. At the time Malawi was and still is in the process of decentralising its government. Planning at the local level is a necessity and yet the capacity is limited. The project was broadened to develop a planning tool which could be used to identify appropriate investments in physical infrastructure which responded to the needs of the people.

Building on the work from the Philippines, the accessibility planning process was applied throughout the District. Even with the limited capacity at this level it was shown to be perfectly feasible to collect and analyse the data from the village surveys and to develop, based on access needs, a plan for both improving mobility and the location of essential services such as boreholes and health centres. It is now intended to extend the process throughout Malawi.

The important point here is that the accessibility planning process is a participatory one both in terms of the data collection but also for the data analysis. It provides a simple and cost effective process which identifies the actual needs of the rural population. Moreover it can be used by local communities and local authorities so that they can define their own priority needs. This is not to say that it is a planning system in its own right; it is not. It is however a powerful tool that can be used in the development of such a local level planning system.

Guidelines on proposed approach to rural access planning.

1. **Collect Data** using participatory approach through interviews and discussions with village groups and key informants to identify:

   - agricultural activities - crops grown, inputs used, yields obtained;
   - access needs - frequencies and purposes of trips, including seasonal variations, distances and times of travel to various facilities, loads moved, means of transport used and costs of transport;
   - nature of local infrastructure - particular problems, seasonal variations;
   - what are seen as main access needs and problems and solutions that are suggested;
   - to what extent is access seen as a constraint on agricultural and other activities, what is likely outcome of removing or reducing constraints;
   - what means of transport are available, sources of supply, cost, affordability, sources of credit, availability and effectiveness of facilities for repair and maintenance;
   - what transport services are available, where and how frequently they operate, cost and affordability, to what extent they are used.
2 Collect Data from other sources which may be relevant to present or future access needs of the community:

- activities and development plans of authorities dealing with water, forestry, agriculture, community and industrial development;
- details of development agencies and NGOs active in the area, their present activities and future plans;
- details of external markets that could be brought within reasonable access of the community and their potential to market additional produce;
- assessment of work opportunities in rural centres that could be brought within reasonable access of the community.

3 Prepare Map(s) defining the system using the data collected. Show:

- population distribution, location of facilities and main topographical features;
- details of infrastructure, identifying paths, tracks and roads;
- main access routes with brief notes on quality and constraints on access;
- levels of traffic, people and goods, on access routes, and typical seasonal variations;
- routes with transport services and brief details of services;
- levels of access to various facilities, identifying major problems and constraints;

4 Identify a Range of Options to improve accessibility in relation to the objectives of the planning exercise and assess their cost-effectiveness:

- discuss options with communities to identify possible problems, opinions on effectiveness and judgements on priorities;
- rank options in terms of some measure of effectiveness in improving access - for example: number of households affected x average time saving;
- estimate costs of implementing the top ranking options and select a range that it would be possible to implement with available resources.
- rank interventions in terms of cost and community priorities and select those to be implemented. Ensure that these fit together to provide an effective impact without significantly depending on related interventions;
- plan the implementation of the selected interventions.

The system which has been developed should be considered as the master planning model for the district. The list of ranked interventions may be used as a “shopping list” for development funds which can be attracted into the district.

6.2 Guidelines on Implementation

6.2.1 Location or relocation of facilities

The potential for and practicality of this option will depend very much on local conditions and resources. If a new facility is to be introduced then the “optimum” location in respect to catchment area and
infrastructure can be identified from the system map. The choice between a number of possible sites can be based on a simple “accessibility index” of the form -

\[
\text{number of people served by the facility} \over \text{average time of access to the facility}
\]

However, a choice of site should, where possible, be discussed with the local community to attempt to reach a consensus of agreement. In the case of relocation of a site, the most important guideline is to ensure that this option, and other non-transport options, is fully considered and evaluated. If access to a facility is particularly difficult for a majority of households because of poor infrastructure or limited availability of transport then it may be more cost effective to relocate the facility or introduce a new facility than to improve infrastructure or improve the availability of transport. Again this is an option which needs to be discussed with the local community.

6.2.2 Infrastructure

The key principal in the planning and implementation of local infrastructure is to involve the villagers, and any other potential beneficiaries, at all stages of the process. There are several reasons for this:

- it can ensure more accurate identification of patterns of travel and the infrastructure bottlenecks;
- it engenders a sense of ownership of the infrastructure by local people, who may be asked to contribute to its improvement and maintenance;
- the support necessary from outside the community in terms of technical skills, materials and equipment can be more easily determined.

In Tanzania, as in several other countries, it is reported that, at the time of independence, many communities used to look after their own roads. This habit died out as government became increasingly centralised and villages grew accustomed to the idea that it was the task of government to provide roads. Now a Village Travel and Transport Project in Tanzania is trying to re-introduce the idea of local-level implementation of rural infrastructure improvements as one of its main components.

In Nepal the Bridge Building at the Local level (BBLL) Programme, which commenced in 1989, has focused on the strategies necessary to activate, promote and support people’s problem-solving and self-help ability for foot bridge building. The BBLL Management Unit has been intentionally kept small to avoid the risk that it assumes too much responsibility. Flexible approaches, including different alternatives for the organisational arrangements, have been used depending on each local situation. The contributions of the partners have, however, been fixed. Beneficiaries are responsible for arranging the local material while BBLL contributes the external material. The responsibility for running the project lies with the community with BBLL providing organisational and technical support.

It is now accepted in many developing countries that the improvement of local level infrastructure should be for the people and by the people. The role of the district and central government is that of facilitator. This facilitation may include providing the skills and resources not available at village level. A well-designed programme needs to have a clear cost-sharing agreement. Rationally, the share of central government will decrease moving down the road hierarchy from the national trunk roads, where it may provide all the cost, to the village and feeder roads where most of the "cost" may be borne by the local communities. Cost here is taken to include contributions in kind.

The outside support usually needed by local communities is of three types:

- technical skills and supervision;
- materials;
- equipment.
Technical skills and supervision: many self-help projects fail, not because of lack of effort, but because of poorly-designed and poorly-executed work. Technical direction is required both in the planning, and in the execution of the work.

Materials: certain materials, such as sand and stone, can be collected locally. Others such as cement must be brought from outside. Design of rural infrastructure works should make maximum use of local materials. For example, preferring stone masonry to reinforced concrete for cross-drainage culverts. In building the Dhankuta to Hille road in Nepal, all cement had to be portered to the site. This added 70% to the cost of each bag of cement. To maximise the use of local materials, all culverts on the project were constructed as stone masonry arches and all retaining walls were built of stone masonry.

Equipment: labour can substitute for much of the equipment traditionally used in the building of rural infrastructure. However, certain equipment is difficult to substitute economically. For example, the haulage of materials above distances of a few hundred metres is more economical by animal cart than by head loading or wheelbarrow, and above about one or two kilometres is usually more economical by motorised transport than by any other means. Also, compaction of soil or gravel to form a road can be carried out by hand rammers, but is much slower and less effective than by using a heavy roller, either self-propelled or towed behind a tractor or other vehicle.

Generally for most local level infrastructure, the supervision, materials and equipment account for slightly less than half the cost. Therefore, potentially local communities can provide at least half the cost of infrastructure improvement, if they are willing to provide labour.

Care needs to be taken in these types of self-help arrangements to ensure that labour provided is truly voluntary. There is always a risk that the poorest members of a community may be asked to contribute the most in terms of free labour, even though they may have the least to gain economically from the infrastructure improvements. For this and other reasons, paid labour can sometimes be more satisfactory and more equitable than self-help labour.

Finally most rural infrastructure works fail due to a neglect of maintenance. Communities can be mobilised and projects can be launched to carry out improvements in a once-off effort. It is harder to organise the long-term commitment required for maintenance of these improvements. For this reason maintenance is often forgotten. However, earth roads, tracks and paths can quickly revert to poor condition if left unmaintained, even for short periods. Heavy rainfall, in particular, can rapidly destroy roads and paths if drains become blocked or potholes develop. Consequently, maintenance arrangements need to be determined and agreed before any improvement works are undertaken.

In one village in Masasi District of Southern Tanzania, the villagers have agreed to provide free labour for maintaining a village road that they had built themselves. Each village works two days a week for a period of about one month after the rains each year. This has been found adequate to keep the village road in a good passable condition for the rest of the year.

6.2.3 Means of transport

Whereas location of facilities and improvements to infrastructure involve decisions and investments by communities or local or National Government bodies, improving the availability and use of means of transport involves decisions and investments mainly by private individuals and organisations. It is therefore significantly more difficult to promote and achieve improvements in this element of accessibility.

A means of transport is used mainly for internal transport and for shorter external trips (Section 4.3) and will be some form of IMT. Households may decide to purchase or hire an IMT depending on their need and the availability, acceptability, financial gain from ownership, value for money and the status incurred by the IMT. Hiring may be financially better for many households whose annual need for transporting crops is low. However, in hiring, the household loses some control over its agricultural activities - for instance, it may not be able to get immediate access to an IMT at harvest when demand is high. This
may result in crops being left in the field for too long and suffering some deterioration and loss of value. Since a household is likely to only hire an IMT for the economic purpose of transporting crops it also loses the benefits of having it available for other transport activities during the year.

If the planning process has been carried out with effective community participation then a decision to implement an intervention to introduce or increase the use of IMT should indicate that there is a demand for IMT in the area. However, identifying a "real" demand is one of the major difficulties of interventions to increase use of IMT. To be sustainable, the introduction and supply of IMT must be on a commercial basis, so that "real" demand means that households are prepared to purchase IMT. Sometimes demand may be expressed as "I would like one (although I cannot afford one)", or there may be hidden motives. For instance, a project in Northern Ghana involved the dissemination of bicycle trailers as part of a package which also included creation of jobs on local road rehabilitation. Women expressed a keen interest in obtaining trailers but the actual sale of trailers was quite limited. It was subsequently found (29) that much of the indicated demand was because women felt that this would help them gain benefits from other parts of the project.

The first stage of implementation, prior to investing significant time or effort, should therefore be to check that real potential does exist for introduction or expanded use of IMT. This should include an estimate of the likely income that can be earned from purchasing the IMT to see that this is adequate to buy the IMT outright or repay a loan, and also that there are adequate local resources to support the supply or manufacture of IMT and their subsequent repair and maintenance.

Some governments and development agencies take the view that the introduction and spread of IMT will be taken care of by the private sector. This has been the case in many Asian countries where IMT are widely available, there is good awareness of IMT in rural communities and there are active entrepreneurs, but seldom occurs in African countries. Even in Asian countries the emphasis on growth in IMT has been mainly in the supply of motorised IMT to higher income households and there has been much less involvement of the private sector in promoting lower-cost types such as animal-drawn carts and bicycle trailers which are more appropriate for lower-income households.

The level of intervention needed will depend on a number of factors, including; existing level of use of IMT; awareness in the community of the types of IMT available and their benefits; the locally available resources to support the dissemination of IMT, such as workshops, materials and credit-sources; and the activeness of local entrepreneurs. In some cases IMT introduced by an entrepreneur seem to spread almost spontaneously with no intervention needed - for example the motorcycle sidecars in the Philippines (A4) and single-axle tractors in Sri Lanka. In other cases there may need to be extensive work with communities over a considerable period of time - for example, the case of bicycle trailers in Sri Lanka described in Box 4.

Guidelines on level of intervention needed

Levels of intervention needed to meet some of the common situations found in rural communities are outlined below:

- If there are already accepted modes of IMT in use but quality or supply does not satisfy demand then an intervention to upgrade manufacturing capability will be appropriate. This is relatively straightforward, involving work with local workshops and technical institutions to improve designs, methods of manufacture and possibly sourcing of materials and components. Working with local organisations to develop locally accepted IMT is reasonably low risk although there may be some initial resistance to changes in traditional designs. However, it may still involve a significant input of resources if institutional development is included. An example of this approach is given in Box 5.

- For lower income households affordability is often the main constraint on ownership of IMT. If IMT are accepted in an area, but their use is clearly constrained by lack of affordability then the intervention needed is likely to be to work with local organisations to improve the availability of credit. Guidelines on this approach are presented in Box 8.
Box 4: Introduction of bicycle trailers in Sri Lanka

Bicycles are widely used in Sri Lanka for both personal and goods transport. On this basis a programme was initiated in 1990 to introduce cycle trailers to increase the load-carrying capacity of bicycles. This followed on from a successful project in Andhra Pradesh state in India in a similar situation. A video film had been made of the use of trailers in this project which proved useful in their initial introduction into Sri Lanka. Initially workshops were trained to manufacture trailers in two districts where surveys indicated good potential for use of the trailers. A few trailers were sold to traders who immediately saw their benefits. For example, a fish seller saw that he could carry nearly three times as much fish as on his bicycle, extending his sales into more villages and significantly increasing his income. Small batches were also distributed to a number of organisations providing credit in the rural communities, for demonstration and promotion.

The initial take up of trailers was quite slow and by 1994 only 40 had been sold. However, this was a sufficient base to mount a more active marketing approach. Trailers were demonstrated at village markets and presentations made to village groups, the latter including talks by existing users explaining the benefits they have gained from their trailers. This has had a good impact and by the end of 1995 over 150 trailers had been sold. Local bicycle retailers have been approached to market the trailers, but although some have been interested, accommodating the mark-up of a retailer without increasing the trailer price may significantly reduce the income received by the workshops. It seems likely that if this approach is to be used, workshops will need to produce reasonably large numbers so that they can use cost-effective batch production methods.

The trailers are used mainly for commercial use by small traders but around 50% are also being used in domestic transport activities to reduce household burdens. Another significant use is in carrying sick persons to hospital. Workshops and users have been quite innovative in adapting trailers for different uses. Most are now made with seats fitted each side over the wheels and some are produced as mobile shops with canopies to protect the goods being sold. The demand for trailers is spreading to other districts and the main constraint on growth of sales is the limited amount of credit available.
Box 5: Overcoming a constraint on the manufacture of ox-carts in Zimbabwe

Ox-carts, known locally as scotch-carts, play an important role in small-scale farming in Zimbabwe. They may be centrally produced or manufactured locally by small-scale workshops, the latter using scrap axles from motor vehicles being at least 25 to 30% cheaper than the former. From the late 1980s, supplies from small workshops were increasingly constrained by a shortage of scrap axles which were instead being repaired and reused by vehicle owners. A programme was formulated by Intermediate Technology Zimbabwe to address this problem using a wheel making technology developed by IT in the UK which comprises a hand-bender for bending wheel rims for any type of tyre from standard steel sections and an assembly jig for welding up the wheels.

The first step was to set up a pilot training course to assess the suitability and acceptability of the technology. Artisans from a number of key technical institutions were trained at a local mission workshop. This proved successful and funding was obtained from the UNDP for a three-year collaborative programme between one of the institutions, the Government Institution of Agricultural Engineering, and IT Zimbabwe to carry out a nation-wide scheme to disseminate the technology to rural workshops. Eight training courses were held in rural centres around the country so that workshops were trained in their own environment and in the main, courses were hosted by technical institutions that were willing to provide ongoing support and training to local workshops so that a national network of support centres was established.

Surveys of local workshops were carried out prior to each course to select those interested in and suitable for training. The former was found by demonstrating the equipment and wheels that could be made, and the latter based on a number of set criteria such as the workshop already being involved in making carts, being adequately equipped and demonstrating satisfactory level of skill and quality in their existing work. Follow up visits were made about four months after training to monitor progress in adopting the technology and to help in overcoming any teething problems. 55 workshops were trained and two years later about half are using the technology on a commercial basis. It was found that artisans needed a certain level of business acumen and ambition to take advantage of the technology.

The technology is now established on a sustainable basis. Over 300 carts have so far been produced by trained workshops and a few better equipped workshops are manufacturing and marketing the production equipment. Although there was some initial resistance to the new types of wheels and axles this was overcome fairly quickly by the good quality of carts produced by a number of the workshops and their attention to customer satisfaction. It was found that acceptance tends to snowball - once one or two carts were purchased in a village then further orders were usually forthcoming. One other factor that was found necessary to consolidate sustainability was to establish a reliable supply of bearings for axles. Initially it was thought that second-hand bearings could be used but the supply quickly dried up and it was necessary to secure a supply of low-cost bearings from China. This was made possible by a guaranteed demand from a group of trained workshops.

Overcoming the constraint on availability of wheels and axles has increased the supply of carts in the low to medium price range and enabled some workshops to expand their business quite substantially.
Box 6: Credit in Support of the Wider Use of IMTs

The Role of Credit

For the poor and very poor, the acquisition of even the simplest intermediate means of transport is likely to involve such a 'lumpy' investment as to be beyond their own resources. In Bangladesh, for example, the purchase of the cheapest bicycle, from China, calls for a sum equivalent to total earnings from about 80 days of employment at the average wage rate for casual employment in agriculture. In Malawi, the cheapest bicycle imported from India costs the equivalent of 160 days earnings at the rural minimum wage. In the late 1980s, owing to distortions in government policies on import licenses, it took as much as 650 days earnings at the rural minimum wage to buy a similar bicycle.

In this context, access to credit is likely to be the only realistic way in which the poor are likely to be able to upgrade their technological ability to travel and carry goods. Indeed, the experience of the Grameen Bank and the Bangladesh Rural Advancement Committee (BRAC) in Bangladesh - probably the world's two largest non-governmental sources of credit for the rural poor - has confirmed that borrowing to invest in transport hardware (mainly second-hand cycle rickshaws) is typically about the fifth most popular use of credit.

Caveats in the Design of Credit Services for IMTs

Over the past 15 years or so, the world has learned that the rural poor are much more 'bankable' - much more credit-worthy - than had been believed. There are, nevertheless, two caveats surrounding this conclusion.

First, good 'credit discipline', hence satisfactory credit recovery, depends critically on adequate numbers and quality of field staff for the collection of dues. Secondly, good credit recovery depends on the need of beneficiaries to preserve their continuing entitlement to credit. People will do their best to meet repayment obligations if they know that (a) they will need credit in the future, yet (b) their entitlement to that future credit will depend on their performance in repaying current loans.

Against this background, there are three important factors to take into account in the design of credit services for IMTs. First, some care must be applied in assessing the hard financial viability of IMTs. In other words, the acquisition of an IMT - of whatever type - must bring more or less immediate financial benefits to users. Indeed, there must be sufficient financial benefits to give confidence that credit repayments can be afforded. Secondly, the providers of credit for the acquisition of IMTs must be able to finance the relatively high overhead costs of having adequate numbers of credit supervisors and repayment collectors. And thirdly, the relatively 'lumpy' investments for IMTs should ideally be linked to a continuing requirement for credit among the target group.

Lessons Learned from Experience

1. Work directly within the community and, to the greatest extent practical, utilise local resources for funding the effort. Give the beneficiaries a stake in sustainability by putting local resources at risk.
2. Provide credit access in a timely manner and with a minimum of fuss to the borrower. Excessive application of project effort to monitoring the use of loan funds tends to create distractions and, given the inherent fungibility of money, seldom ensures that project resources actually buy what they are intended to buy. If investments are not the best available, then loan funds will be used in some other manner, regardless of project regulations.
3. Attempt to recover the variable costs of lending by charging interest rates that cover lending costs. Subsidised interest rates undermine the commercial viability of credit projects.
4. Maintain repayment discipline and apply innovative lending methodologies that assess and reduce risk in cost-effective ways. Such innovations include:
   i. transparent use of local resources at risk (by employing locally generated savings in the loan fund);
   ii. a graduated approach whereby initial loans to each borrower are small and larger loans are made available only after borrowers have shown their ability to repay loans;
   iii. peer pressure to ensure repayment by either explicit joint liability or by publicising defaulters;
   iv. local knowledge in the appraisal process by requiring co-signature of important local persons who know or who can vouch for the borrower;
   v. retention of ownership of goods purchased by the loan until it is paid off (i.e. lease/purchase).
in some cases the use of IMT may be restricted by high cost. For instance the demand for bicycles in Kenya (30) and Malawi (31) has been significantly restricted in the past by high Government duties. Recent reductions in duties have brought about a substantial increase in demand. IMT manufactured in Sub-Saharan Africa tend to be costly because of the high cost of steel sections and of components such as bearings and tyres. The objective of an intervention in these situations may be to lobby Government on reducing duties and to help local manufacturers find cheaper sources of materials and components.

if there is limited use of IMT in an area or a clear need to introduce improved or more appropriate forms then a substantial intervention is likely to be required, involving considerable work with local communities. Guidelines on the implementation of this level of intervention are presented below.

Guidelines on implementation of interventions to introduce and disseminate new or improved forms of IMT

The need and potential for IMT should already have been established from the planning stage and the follow-up assessment. Section 4.3 gives a preliminary guide on IMT which may be appropriate in relation to topography, infrastructure and affordability. However, it is again emphasised that an integrated approach is needed and an intervention may combine upgrading of infrastructure to match the introduction of IMT.

In addition to physical and financial factors there are a range of intangible factors, often referred to in the term “acceptability,” which affect the willingness of households to invest in means of transport. Since the cost of IMT is usually equivalent to many months income for a rural household, it represents a high risk investment and naturally rural households tend to be quite conservative in considering the purchase of an IMT. They prefer to invest in IMT that are already well proven by being in common use in the community and there will be considerable initial resistance to new devices. Breaking down this resistance will be one of the main tasks of the intervention. Once a “critical mass” of the IMT are in use in the community then further growth in adoption is likely to be self-sustaining. The important aims of intervention are therefore to achieve this “critical mass” and to create conditions to support further sustainable growth in adoption. The stages of a proposed approach are as follows:

1. **Assessing acceptability:** having made a selection of IMT which are suitable to local conditions and income levels an attempt should be made to assess which types may be acceptable. This may be done by showing photographs of their use in other locations or a video can be very helpful if equipment is available. Based on reactions, two or three options may be selected to give households a choice and possibly to suit different income levels.

2. **Creating awareness:** an initial batch of the IMT should be manufactured to demonstrate their use and benefits to the community. Enough should be made to create an effective awareness, at least 5 to 10 units of each type. Since local manufacturers and potential users are unlikely to invest in these they will need to be funded through the intervention, although some funds may be recuperated from hiring them out or selling them at a later date. Ideally the IMT should be manufactured locally but if suitable workshops are not available, then in the nearest rural centre. Designs should be compatible with locally available materials and workshop skills and resources.

3. **Training:** training of workshops is likely to be needed. However, the approach will depend on the initial response of workshops. If there is enthusiasm for the IMT then a number of workshops may be initially trained from different districts as they may help in promoting awareness of the IMT. Workshops need to be carefully chosen to have adequate skills, some visible pride in their work as judged from existing devices they are making, reasonable business sense and an ambition to develop. If a guarded response is initially forthcoming then it may be better to contract one or two workshops to manufacture the demonstration IMTs and to train additional workshops when demand justifies this. It is an advantage to channel training through
4. **Demonstration and promotion**: the demonstration units should be located with high profile users in the community who are able to effectively demonstrate their use and benefits. It is an advantage to work through local organisations that are able to organise, supervise and monitor the demonstrations, for example NGOs working in the community. The demonstration units will usually be loaned out to users, or possibly hired out at a low rate. Trials should cover a harvest period and should be carefully monitored to ensure the units are being used and to quickly identify any technical problems. Promotion may include showing the IMT off at local agricultural shows and in local markets. Active promotion and marketing are important in establishing and developing demand. For example: selling initial units at a discount rate to get more into the community; a warranty from the supplier guaranteeing free repair for a specified period; delivery of units to the purchasers.

5. **Production**: once confidence in the performance of the IMT has been established and demand begins to build up then production can be organised on a commercial basis. Training may include advice on business management, for example on efficient methods of batch production. The importance of maintaining good quality control should be emphasised as this is often a failing of small manufacturers.

6. **Back-up support**: the main area in which support is likely to be needed is in improving availability of credit to potential purchasers of the IMT. This is best developed through existing credit organisations. Guidelines are presented in Box 5. Support may also be needed in establishing sustainable supplies of materials and components. Small manufacturers are often disadvantaged by only being able to buy materials in small quantities and there are advantages in organising cooperative purchasing. However, this is difficult to arrange and is likely to depend on finding a sympathetic supplier. An advantage of local manufacture is that support for repairs and maintenance is readily available to purchasers.

The guidelines presented above propose a relatively commercial approach working mainly with producers and credit organisations. This is particularly applicable in areas where there is a cash economy and means of transport provide potential for households to increase their income. An example of this approach is described in Box 4. In a mainly subsistence area with limited marketing of produce then a more community-based approach may be needed as outlined in Box 2.

6.2.4 **Transport services**

The formulation of the system map should clearly identify needs and specifications for transport services, including routes, infrastructure, distances and estimates of passenger and goods movements. Appropriate modes to match these needs and specifications can be selected from the data presented in Table 4.3.

In general, transport services will be income-generating so that providing they are economically viable they can be left largely to the private sector. However, some interventions may be needed to demonstrate possibilities and potential, particularly for motorised IMT which provide more localised services into the villages. The nature of the intervention will depend on the type of transport service needed to improve accessibility. Typical rural transport services can be divided into four categories. These are outlined below with guidelines on the interventions which may be needed to establish the service. Again an integrated approach is needed which may include upgrading infrastructure to improve operation of the transport services and establishment of links between local transport services and external services.

1. **Bicycle - taxi service**

   Bicycle-taxis are suitable for short journeys of up to about 10 km on mainly flat terrain. They
carry a single passenger and small loads. They are particularly suited to low-income areas and areas where access is on narrow paths. Advantages are low investment, simple technology and provision of income-generating opportunities.

Intervention needed: providing infrastructure is suitable the main constraint on introducing these services will be whether the concept is acceptable to potential operators and users. A limited intervention may be needed with 5 to 10 operators to demonstrate the service. If there is a genuine demand and the concept is acceptable then the service is likely to expand quickly. As an example, a bicycle-taxi service operating on one of the main routes into Kisumu town in Western Kenya has grown to 200 operators in less than 2 years, making over 15,000 trips and generating over $3000 per week.

Motorised IMT operating on a route basis

These services are similar to those offered by motor tricycles in the Philippines described in Annex 4. They generally operate over access routes out of and into the villages over short to medium distances. They may also provide access to external transport services for longer distance trips. These services are found in a number of Asian countries but seldom in African countries. The services are generally provided by motorcycle-based vehicles - sidecars, three-wheelers or trailers - or single-axle tractor-trailers. An advantage of this type of service is that it requires a relatively low level of investment and can readily be operated by a small entrepreneur.

Mini-bus type vehicles such as the Matatus in Kenya and the Jeepneys in the Philippines offer a higher-level service generally between rural centres and larger villages where access infrastructure is suitable. They tend to operate mainly on secondary roads and not on village feeder roads.

Motorcycle-based vehicles are suited to trips up to about 40km. They may carry goods or passengers. In undulating terrain with variable infrastructure typical capacity is 3 to 4 passengers or about 300 kg load. On mainly flat terrain and good infrastructure they can carry considerably more. Some wrap-around type trailers used in the Philippines may carry up to 15 passengers and trailers used in Cambodia have rated capacities of 12 passengers and 1 tonne loads.

Single-axle tractor-trailers are slower and a reasonable range is up to 20km. However, they have good load capacity of about 15 passengers and 800 kg loads. They are usually used in conjunction with agricultural activities and little appears to have been done to develop them specifically for transport services, although some are provided with seats. It is considered that this is a possibility which is worth investigating.

Interventions needed: an important issue is the Government traffic regulations on operation of these types of vehicles, particularly for carrying passengers. If these types of vehicles are not already used, as in most African countries, then no regulations may exist and negotiations will be needed with the traffic licensing authority before the transport services can be introduced. In other cases, regulations may be restrictive. For example, in Sri Lanka single-axle tractor-trailers are not licensed to carry passengers, but because they are such an important means of transport for the rural poor the authorities tend to ignore this restriction. The initial intervention will therefore be to establish the relevant regulations on operation of the proposed types of transport services and, if necessary, to negotiate an agreement with the traffic licensing authority for their operation. For safety reasons it is advisable to require licensing of vehicles and operators.

The level of technical assistance needed in an intervention will depend on the extent of existing use and support facilities for the types of vehicles proposed. In many Asian countries there are good facilities for maintenance and repair of motorised IMT, even at village level, and there is unlikely to be a need for significant technical assistance. However, in most African countries
such vehicles are little known and substantial technical inputs will be needed. Effective maintenance, repairs and spare parts supplies are essential for establishing sustainable transport technologies and the intervention will need to ensure that these are in place. This is likely to require a training programme for operators and mechanics similar to that described in Reference (7).

The third area of intervention will be to promote the establishment of the service. If similar services are known elsewhere in the region it may be possible to persuade an entrepreneur to set up a service if the economic viability can be clearly proven. However, in most cases it will probably be necessary to set up a pilot scheme to demonstrate and prove the service. This will involve purchase of one or two vehicles, manufacture of attachments needed and establishment of required technical support. Operators may be contracted to operate the service or the vehicles hired out. The pilot service should be monitored over a period of one or two years to establish effective operating procedures and the cost-effectiveness of the service.

3. Village-based transport service

In this case the motorised IMT provides a transport service to a village or group of villages, providing more in the way of a taxi service to individuals on a multi-hire basis. The advantages are greater flexibility and improved access to a wider range of facilities than might be served by route transport services. A particular advantage is improved access to health facilities, especially hospital.

**Intervention needed:** this will be the same as for category 2, with the emphasis on a pilot scheme to test the viability of this form of transport service. If viable, the level of investment needed is low enough for the service to be run as a small business.

4. External transport services

These comprise conventional vehicles, buses and trucks, and in a few cases trains or boats. Buses and trucks mainly operate on primary or secondary roads and are important to rural communities in providing access over longer distances and access to the main rural centres. They will usually be based in urban centres. Services may be infrequent and irregular, and particularly on secondary roads, may be withdrawn in the rainy season if access is particularly difficult. The initial costs of these forms of transport are high and high utilisation rates are needed for them to be cost-effective.

**Intervention needed:** if accessibility planning shows that improved external transport services are needed the main intervention needed will be to carry out a feasibility study to evaluate the cost effectiveness of introducing a new service or upgrading an existing service. It is unlikely that this will justify setting up a service because of the high utilisation rates needed (there will also be considerable problems with management and maintenance) and the most practical option may be to negotiate with an existing operator to provide a service which gives an acceptable level of access. Another option may be to consider a service based on smaller vehicles such as pick-ups or mini-buses which may be more compatible with the traffic flows of passengers and goods and which could be used to an effective level of utilisation. The viability of this option will depend very much on whether it can be run at an acceptable profit. If so, then it should be possible to establish the service as a small business. If not, then it might have to be run on a community basis with some subsidy. This is not desirable because of the difficulties of implementing effective management and technical support and the risk of the scheme not being sustainable on a long-term basis.
APPENDIX 1

Data on operating costs of vehicles for transport services
**TABLE A1: DATA USED IN ESTIMATING OPERATING COSTS OF VEHICLES FOR RURAL TRANSPORT SERVICES**

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>Typical Initial Cost ($)</th>
<th>Depreciation ($/day) (1)</th>
<th>Operator Cost ($/day)</th>
<th>Fuel Cost ($/km)</th>
<th>Maintenance Cost ($/km)</th>
<th>Running Cost ($/km)</th>
<th>Fixed Cost ($/day) (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle</td>
<td>100</td>
<td>0.031</td>
<td>1</td>
<td>-</td>
<td>0.015</td>
<td>0.015</td>
<td>1.09</td>
</tr>
<tr>
<td>Bicycle &amp; Trailer</td>
<td>200</td>
<td>0.162</td>
<td>1</td>
<td>-</td>
<td>0.018</td>
<td>0.018</td>
<td>1.18</td>
</tr>
<tr>
<td>Motorcycle &amp; Trailer or Sidecar</td>
<td>2400</td>
<td>1.92</td>
<td>2</td>
<td>0.05</td>
<td>0.016</td>
<td>0.066</td>
<td>4.68 (2)</td>
</tr>
<tr>
<td>Single-axle Tractor-Trailer</td>
<td>3000</td>
<td>1.92</td>
<td>2</td>
<td>0.07</td>
<td>0.04</td>
<td>0.11</td>
<td>4.64</td>
</tr>
<tr>
<td>Diesel “Pick-Up”</td>
<td>12,000</td>
<td>7.80</td>
<td>4</td>
<td>0.10</td>
<td>0.05</td>
<td>0.15</td>
<td>14.2</td>
</tr>
<tr>
<td>7 tonne Truck</td>
<td>60,000</td>
<td>36.0</td>
<td>5</td>
<td>0.50</td>
<td>0.30</td>
<td>0.80</td>
<td>49.2</td>
</tr>
</tbody>
</table>

**Notes:**

1. Based on estimated economic life at 10% interest rate

2. Fixed costs (depreciation + operator cost) have been increased by 20% to allow for licensing, insurance and overhead costs.
APPENDIX 2

References
REFERENCES


7. British Overseas Development: *Now motorcycles can go the distance*; Issue No.47, July/August 1996.


15. Ian Barwell: *Local-level Rural Transport in Sub-Saharan Africa, Final Synthesis Report on Village-level Travel and Transport Surveys and Related Case Studies*; prepared for


22. Peter Crossley, Simon Ellis and Mark Stallabrass: *A handbook of Rural Transport Vehicles in Developing Countries*; prepared for the Overseas Development Administration, UK, 1996.


ANNEXES

Annexes 1 to 4 contain summaries of studies/reports commissioned by the ILO to look at the various issues of accessibility. These are as follows:


Annex A2 : *Study of Daily Transport Patterns in Garut District, Indonesia*; DC Johnson, Department of Geography, University of Canterbury, New Zealand


Annex A4 : *Rural Transport Services in the Philippines*; Ian Barwell, IT Transport Ltd, UK.

Copies of the full reports may be obtained from the International Labour Office, Geneva
SUMMARY OF 'USE OF DONKEYS IN KENYA'

Limuru Division is a highly productive agricultural area of Kenya, about 30km from the capital, Nairobi. The main highway from Nairobi to Mombasa traverses the area, which is well-integrated into the national economy but is subject to some land pressure, with an average land-holding of about 0.8ha. The main crops are potatoes, maize, vegetables, fruit and minor cash crops, and there is intensive livestock-keeping and dairy production. Apart from the national highway, all the rural roads in the study area are earthen and some are in poor condition. Away from the national highway transport services are infrequent and unreliable. The main goods movement needs of rural households derive from farming, and include water haulage, produce marketing, and movement of animal feed, fertilizer and manure.

Passenger cars are owned by 13% of households in the study area - 85% of the cars are owned by household heads employed in the formal sector. Pick-ups are owned by 10% of households, most of whom are engaged in business activities. Donkeys are owned by 43% of households, most of which own 2-3 donkeys. Donkey owners are primarily involved in farming although some donkeys are owned specifically to provide transport services. One of the reasons for the popularity of donkeys is the proximity of Limuru to a Maasai area where donkey ownership is traditional. However, unlike the Maasai, the people of Limuru use donkeys to haul carts. There is a higher proportion of donkey ownership among farming households with larger land-holdings, and among those more distant from the main road. Farmers with small holdings, or close to the main road, have lower transport demand and hence less justification for ownership of donkeys.

The primary reason given for owning donkey carts is to haul water. Water supply is a problem in the area, and for seven months of the year (most of the dry season) most households are dependent on boreholes which on average are just over 1km from the dwellings. Because of the agricultural system practised there is a high demand for water - it is required for domestic purposes (about 70 litres per household per day), for cattle (about 200 litres per day for 85% of households), and for poultry (about 225 litres per day for 23% of households). The scale of this transport burden is beyond the scope of human portage for many farmers, and 63% of households depend on donkey carts for transport of water.

Donkey carts are used by over 60% of households for marketing of maize and potatoes, which are sold in local markets (average distance 3km) but are heavy and bulky to transport, and by over 50% of households for marketing of carrots which are sold in more distant markets (average distance 9km). However, other modes are used for other produce. Milk is marketed primarily by human portage since the amounts sold twice per day are small, distances to the local delivery points are short, and the milk must be handled carefully to avoid spillage.

Many of the cattle are zero-grazed, and during the dry season farmers must travel longer distances to collect fodder such as grass, maize stalks, etc. Donkey carts are widely used for this task, since the cargo is bulky, and their use allows the farmer a wider choice from alternative sources of fodder. Industrially processed animal feed is a supplement to this fodder for cattle, and is mandatory for poultry farming. 67% of households use donkey carts to transport this feed, since
the procurement points are more than 2km from the dwellings and the average annual consumption is more than 1 tonne. Fertilizer and manure collection represent less significant transport tasks, since many cattle are zero-grazed and fertilizer is purchased in small quantities from local stores.

For activities such as water collection, marketing and collection of animal feed the level of cart use significantly exceeds the level of ownership, indicating that non-owners hire carts for specific activities - cart hire can be a lucrative activity for the owner. Carts are predominantly controlled by men, whereas women are mainly responsible for human porterage tasks. Thus firewood collection, and water collection in households where it is required only for domestic purposes, is done by women on foot.

The transport burden of a particular task is determined by the weight to be moved within a given time period, and the distance over which it is to be moved. In the Limuru area, which has a productive but transport-intensive agricultural system, donkey carts play a crucial role for those tasks where the transport burden is beyond the household’s human porterage capacity and for which motor vehicle services are either not available or are inappropriate. The carts are used primarily for productive activities which generate an economic return - they are not important for personal travel, and are rarely used for subsistence tasks such as firewood collection. Even with development of the rural road network and of motor vehicle services, donkey carts would continue to be important for some tasks - such as water and fodder collection and some produce marketing - because of their ready availability and flexibility. However more widely distributed water supplies, which would be very expensive to provide given the physical conditions in the area - would significantly reduce the transport burden of farming households.

Carts are produced locally using discarded motor vehicle axles which are easily available. However their use is inefficient because of poor harnessing, and poor cart design where a substantial part of the weight is transferred to the neck of the donkeys. These inefficiencies reduce the potential payload capacity from 500kg to 300kg, and cause injury to the animals. The effectiveness of this appropriate transport system could be substantially increased with technical innovation and better animal care, which would require information dissemination and participation of the beneficiaries.
SUMMARY OF STUDY OF 'DAILY TRANSPORT PATTERNS IN GARUT DISTRICT, INDONESIA'

Rural dwellers have poorer access to the facilities necessary for everyday life than those in urban areas. The facilities are further apart and provide lower levels of service, and transport is less easily available. The implication is that rural people have to travel further, and spend more time and money on transport, in order to obtain lower quality services, and as a consequence are likely to make less use of available facilities. However rural areas vary widely in their level of access to services. This study set out to examine how the travel patterns of, and use of public facilities by, rural people is influenced by their accessibility to the transport system and the hierarchy of service centres.

The methodology used was to study villages within a single road corridor leading away from the city of Garut, but at different distances (8 to 65km) from the city. Within each village two hamlets were selected for study, one relatively accessible (the "near" hamlet) the other relatively inaccessible (the "far" hamlet). The survey examined trips of 100 metres or more, thus excluding movements within the dwelling area of the hamlets. In some hamlets water supplies, bathing places or mosques were within this 100m radius and consequently the significance of trips to these facilities, the overall importance of the walking mode and the number of trips by women, are underestimated.

In this Muslim society transport is primarily a male responsibility. Men make nearly 60% of all trips, average male trip distances are twice those for females, the average load carried by a man is four times that by a woman, and the average cost for a trip by a man is three times that by a woman. Thus, while women have a significant transport task, men tend to make the longer trips outside the local area (and particularly those that involve use of public transport), and have primary responsibility for goods movement.

More than 90% of all recorded trips are made on foot, and they account for 38% of total distance travelled and 39% of total load carried (about three-quarters of walk trips involve load carrying), i.e. it is the shorter trips (mean of 1.5km), and those that involve moving smaller loads, that are made on foot. However, because of the slow speed of walking, trips on foot account for 76% of total travel time. Public minibuses are used for 8% of all trips, with a mean trip distance of about 22km, i.e. they are the predominant means of transport for longer trips outside the village, with motorcycles and cars accounting for only 1.3% of all trips. Trucks are used for only 0.5% of all trips, but with a mean trip distance of 40km, and they carry 57% of the total load, i.e. the role of trucks is for long distance movement of large loads of rural produce. No use is made of animal-drawn carts or of bicycles, reflecting the hilly nature of the terrain.

Water and firewood collection together account for 9% of all trips and are on foot. Water collection trips are very short and loads are small, but the mean firewood collection trip distance is over 2km with a load of nearly 30kg. Over 50% of trips are for farm work (20.5%), fodder collection (8.9%), produce collection (7.1%) and to work (13.3%). Some farm work trips were wrongly recorded as 'to work'. Thus agricultural activities account for a significant proportion of all trips, and most households are involved. These trips have mean distances of 1.6-2.3km, are on foot, and are a
The study indicates that the "far" hamlets have more constrained trip patterns than the "near" hamlets. Comparing each pair of hamlets, the households in the "far" hamlets make fewer trips, the trips are of longer duration, average loads moved per trip are higher, and there is a greater dependence on travel on foot. In each case the "far" hamlets use public transport for a smaller proportion of trips. There is some suggestion, though the trend is less strong, that the proximity of a hamlet to the city has an influence on travel patterns. This is seen as a declining role of public transport, and increasing mean travel distances and times for more distant hamlets. However it is noteworthy that the highest mean loads per trip are for the five hamlets that have all-weather road access. Gender roles in trip generation are remarkably even across the hamlets. It is also clear that a position on the main road, and hence direct access to motor vehicles and public transport, generates observable differences in travel patterns.

The study provides useful information on trip patterns and the composition of transport activities, and indicates that a higher level of accessibility results in more efficient utilisation of, or greater benefits from, the household inputs to transport. However the results give no clear picture how the level of access to a facility, in terms of the distance from the facility, affects the utilisation of our facility by the community.
SUMMARY OF 'RURAL TRANSPORTATION IN INDIA: A TIME-SERIES ANALYSIS'

A major, detailed study of the usage of bullock carts vis-a-vis other modes of rural transport was carried out in India in 1978/79. A similar study was carried out, albeit more broadly-based, in 1989/90. Both studies were divided into two parts - Northern and Southern Region. These two studies provide a unique opportunity to compare changes in rural transport patterns over time, and to identify the factors that have influenced those changes. There is a particular focus on bullock carts which traditionally are a very important part of the rural transport system in India.

The time-series analysis shows that economic development, infrastructure improvement and transport demand are inter-related, and that with such developments there is a gradual decline in the importance of traditional, non-motorised modes. An improved road connection to a village is a catalytic factor in this process - overall, the role of bullock carts has declined over the eleven year period. In the Northern Region, measured in tonne-km terms, the proportion of traffic moved by bullock cart declined from 52% to 33% on roads which were in all-weather condition throughout the period, from 77% to 53% on roads which were in fair-weather condition throughout the period, but from 96% to 57% on roads which were upgraded from fair to all-weather standard during the period.

The volume of rural freight traffic in tonnes increased by 130% between 1978 and 1989, indicative of growth in the agricultural sector with more goods being moved out of villages (marketable surplus) and into villages (farm inputs and household goods). However, measured in tonne-km terms, freight traffic increased three times, indicating that not only are more rural goods being moved, but that they are being moved over longer distances i.e. farmers are reaching more remunerative markets and more competitive sources of inputs. Despite agricultural growth the degree of internal movement (between farm and household) has remained static, suggesting that some surpluses are moved direct from farm to market. The share of goods movement by cart (in tonne-km terms) reduced from 70% to 40% in the north and by 16.8% in the south. However, the average external trip distance for carts has increased slightly, reflecting improved road connections. In the case of unchanged fair-weather road connections, carts remain the most important mode. In the south, carts still play the major role in the movement of cereals and pulses, which is over relatively short distances (average 3.2km). There has been a rapid emergence of tractor-trailers in the north, accounting for 15-25% of movement, including the short-distance movement of goods up to 2km. Trucks are important for long distance goods movement. However in the north, high value cash crops such as fruit and vegetables tend to be transported to market by bus.

About 56% of passenger traffic in the north is for trips of more than 10km. Short distance movements are mainly on foot and by bicycle. For longer distance passenger trips (above 10km) buses - and in the north, carts - are important. Marketing and education account for one-third of passenger traffic, and trips for social purposes and entertainment are important. In the south the number of passenger trips per person is significantly higher (60% more) for villages with an all-weather road connection.
Despite the declining overall importance of carts, in the south the absolute level of ownership has increased by about 10%, there has been substantial investment in new carts (the age of the fleet decreased significantly over the period), and there has been some trend towards the use of improved carts with pneumatic tyres, rather than wooden wheels. Cart ownership among farmers owning landholdings of less than 2ha. has increased, reflecting a trend to vehicle ownership - first carts and bicycles, then mechanised vehicles - with increasing incomes. The utilisation of carts, in terms of number of days of use per year, has increased, but the average load carried has declined. In the north, vehicle ownership changes with land-holding - farmers with larger holdings own a cart or a tractor-trailer, whereas bicycles are owned in substantial numbers even at low land-holdings.

The share of traffic generated by rural industries has increased sharply over the survey period, reflecting growth of marketing opportunities, with most movements taking place using mechanised modes. Mechanised traffic now dominates outward movement from marketing centres, with the role of carts being limited to short distance movements. The share of traffic generated by traders has decreased significantly, suggesting improved direct access for both suppliers and consumers to marketing centres.

The study indicates a dynamic rural economy in India, with improved road access and the resultant availability of more efficient transport modes being one factor that contributes to that dynamism, and a consequent rapid growth in overall transport demand. In this situation the overall importance of the bullock cart has declined, yet the absolute level of ownership has increased and investment in new carts has been high. The study indicates that there are three elements to the changing role of the bullock carts:

* New transport demands have been generated - for longer distance movement of larger quantities of goods, and of passengers - which are better met by mechanised modes than by carts;

* Increased rural ownership of mechanised modes such as tractor-trailers and a consequent transfer of some transport tasks, for more affluent farmers, from carts to mechanised modes.

* A continuing, important role for bullock carts in local-level rural goods movement, particularly in areas with lower-levels of accessibility, and amongst farmers who cannot afford mechanised modes;

* Increased affordability and use of carts by farmers with small land-holdings as a result of increased rural incomes.

Thus, while the role of bullock carts is becoming more constrained with economic growth, they remain a crucial element in the local-level rural transport system, and provide a means of extending improved transport efficiency down to people with lower income levels who could not previously afford them.

A3-2
SUMMARY OF RURAL TRANSPORT SERVICES IN THE PHILIPPINES

The Role of Rural Transport Services

The majority of rural households in developing countries do not possess their own means of transport. Rural ownership of a motor vehicle is rare. Even non-motorised means of transport such as bicycles or animal-drawn carts are unaffordable for many rural households. When a household does own a vehicle of some sort, it may not be suitable for all trip purposes (e.g. bicycles are not suitable for long journeys) nor will it necessarily be available to all members of the family (e.g. women generally do not use bicycles). The provision of Rural Transport Services is therefore crucially important in meeting the external transport needs of rural people, particularly for households which do not own any vehicle, for women and others who do not have access to the vehicles owned, and for trip purposes to which owned vehicles are not suited. Similarly, delivery services which distribute goods such as fertiliser address rural access demands by reducing the need for people to travel. However it is generally the case in developing countries that the supply of rural transport service is severely constrained for one or more of the following reasons:

* The condition of the rural road infrastructure is poor and often prevents or inhibits the operation of transport services;

* There are problems in the availability of vehicles because of the high cost, or restrictions on the supply, of imported motor vehicles; the non-availability of spare parts; or inadequate vehicle maintenance capacity/capability;

* The commercial viability, and hence the sustainability, of transport services is dependent on those services generating sufficient income to cover the full economic cost of investment in the vehicle, to cover the operating costs, and to produce a profit. The services therefore tend to operate on those routes where the demand is highest and where operating costs and risks are lowest.

As a result, commercially-operated rural transport services in developing countries are generally concentrated on longer-distance main routes remote from many rural communities, and even then may be unreliable, withdrawn during the wet season, overcrowded, or unaffordable to some people. In some countries services are provided by the public sector on a subsidized basis, but the results are often no better (and may be worse) because of management inefficiency and the difficulty of financing the subsidies that are necessary to sustain the services. It is certainly very rarely the case that regular, reliable transport services operate down to village or community level.

However, in the Philippines, the private sector has responded to this challenge and developed extensive, effective, demand-responsive rural transport services.
Motor Tricycles and Jeepneys in the Philippines

These rural transport services are provided by vehicles which have been developed and are manufactured in the Philippines:

* Bicycles fitted with sidecars have been used in the Philippines for many years. In the early 1960s this technology evolved with the fitting of locally-made sidecars to small (100-150cc), locally-assembled Japanese motor cycles to produce the Motor Tricycle. Motor Tricycles were originally operated to provide short-distance 'taxi' services in Manila, but their use rapidly spread to smaller cities, to towns, and then to rural areas. They are now found in large numbers throughout the rural areas, and it is estimated that about 70% of the national stock of motor cycles are fitted with sidecars. They have been adapted to rural use by strengthening the chassis, body and suspension so that a rural motor tricycle can carry up to 10 passengers or 500kg of cargo or a combination of the two.

* The Jeepney is essentially a long-wheelbase Jeep, fitted with bench seats that can accommodate up to 20 or more passengers. It can be considered as similar to a minibus, but more rugged and cheaper to purchase.

The Rural Transport Services

Rural motor tricycles provide fare-paying passenger/goods transport services. They generally, but not always, operate on fixed routes though they may work different routes on different days according to the pattern of local demand. They provide frequent, reliable services down to rural community level, linking those communities to higher levels of the transport system. A crucial feature of motor tricycle services is that they are complementary to, rather than competing with, those provided by larger, faster vehicles. Thus typical operations are:

i) on fixed routes connecting rural communities to local centres such as towns, markets and social facilities. As a typical example, in the first half of the day the motor tricycles will wait for customers at the barangay (village), and in the second half of the day they will wait at the local town centre to take customers back to the barangay;

ii) providing feeder services on fixed routes connecting rural communities to secondary or main roads where jeepneys and buses are operating regular longer-distance services;

iii) providing short-distance, but readily available and sometimes flexible route, services on secondary and main roads, for which purpose they are more convenient than the jeepneys or buses operating the longer distance services.

Rural jeepneys provide regular services direct to some large, rural communities with good road access. But more generally they operate on secondary and main roads, carrying passengers and accompanying goods, and providing shorter-distance, but more frequent and more demand-responsive, services than the buses - thus while buses will operate at pre-determined (and not very frequent) intervals, jeepneys will wait at a particular route starting point, and when a jeepney has a sufficient number of passengers it will start its journey. A jeepney can also be hired by someone
as a whole vehicle to move a substantial quantity of goods.

Reasons for the Successful Development of Innovative Rural Transport Services

Thus in the Philippines the technology has been developed to provide a range of complementary (but to a degree overlapping), demand-responsive, readily available goods/passenger services that cover the range of movement demands from long-distance personal travel down to local-level movement of people and goods between rural communities and local centres. It is the motor tricycle that is critical to this extensive provision of services, and there are a number of reasons for its success:

1. The Philippines has a culture of technical innovation, and has been able to evolve a type of transport well-adapted to local needs - so for example one finds motor tricycles with different designs of sidecar in different parts of the country.

2. As a locally-produced vehicle, and with the degree of technical competence and adaptability that exists, the motor tricycle is easy to maintain.

3. With its rugged design the motor tricycle can operate reliably, with a heavy load, on poor rural roads. This extends to operation on earthen roads during the wet season - in extremis, when a very difficult stretch of water-logged road is encountered, the passengers will get off and walk while the operator works the vehicle through the mud. The one constraint is that motor tricycles are not suited to very hilly terrain, but in such areas similar services are provided by suitably strengthened motor cycles.

4. Given their low investment and running costs, motor tricycles can operate a frequent service on, and generate a profit from, rural routes serving particular communities where there is simply insufficient transport demand to make the operation of larger vehicles viable. On the other hand (and this is where the concept of complementarity is important), buses can provide cheaper services on long-distance routes where there is heavy demand.

5. Motor tricycles are adapted to the community-level transport needs for movement of people with or without small quantities of accompanying goods, and of relatively small volumes of cargo.

6. Rural motor tricycles are owner-operated, or hired out by the owner to a regular operator. It is rare for anyone to own more than 2-3 motor tricycles. Because the initial investment cost is low, entry to the business is relatively easy and is greatly facilitated by the fact that the motor tricycles are marketed through the extensive network of motor cycle dealers who also provide hire-purchase credit to buyers.

7. While in theory there are an array of licensing and other regulatory constraints on operation, in practice many of these are not strictly applied, so that there is in fact a regulatory environment that allows the private sector the freedom to provide types and levels of service that respond to the market demand.

Many of these reasons also apply, to a greater or lesser extent, to the successful development of jeepney transport services.
Lessons

Rural people need to travel, and move goods, outside their village for a number of reasons - to market their produce, to obtain farm inputs, and in order to make use of commercial services, health and education facilities. Such travel and transport remains a major problem for the large majority of rural people who do not have ready access to their own vehicle. It is local-level external transport, and the first stage (up to the main road) of long journeys that represent the major constraints in the absence of rural transport services. The example of the Philippines indicates that it is feasible to provide extensive, widely dispersed rural transport services that meet people’s movement demands, but that this requires:

i) an enabling regulatory framework that allows the private sector to respond to demand;

ii) technical and entrepreneurial innovation to develop low-cost means of transport, and types of service, that are appropriate to local requirements and are economically viable;

iii) the capacity to produce and maintain the vehicles locally;

iv) suitable credit mechanisms to facilitate investment in the commercial operation of such services.

The implication is that, if the necessary policy measures are adopted and project support provided, there is potential to expand the extent of rural transport services in other developing countries. It is fairly clear that in general, for reasons of commercial viability, extensive services down to village-level must be provided by low-cost means of transport rather than conventional vehicles such as buses. However, the type of vehicle that is appropriate will depend on local cost structures for vehicles, physical conditions such as topography, and on the nature of the transport demand which will be influenced by population density, agricultural patterns, rural income levels and the planning of the provision of public facilities.
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