

# QUANTIFICATION OF ACCESSIBILITY LEVELS OF RURAL AREAS: A CASE STUDY IN THE NORTHERN PROVINCE SOUTH AFRICA

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## **Abstract**

*Socio-economic and political relations in South Africa are characterized by dualism and a high degree of heterogeneity particularly when comparisons are made between urban and rural areas. The lack of mobility and accessibility of goods and persons at the local level is a major factor impeding the integration of rural communities into the national economy. While most rural transport work has been heavily sectoral with an obvious slant towards higher levels of rural road network, little work has been reported on the accessibility and development needs of rural communities. The greater majority of these rural mobility studies have described the accessibility of rural location as a function of distance from gravel or paved roads, distance from bus or minibus routes or total travel time to a node. In this paper a methodology to quantify the overall accessibility level of rural communities has been suggested. The results obtained by applying the methodology in a case study in the Bochum – My darling Transitional Local Council (TLC) in the Northern Province of South Africa have also been discussed. As expected, the value of the derived indices indicated low overall accessibility levels. However, the methodology aids policy and decision makers to quantify and*

*compare accessibility levels of different locations with a view of arriving at sustainable solutions and investment priorities.*

## **1. INTRODUCTION**

Transportation is a vital component of economic development, social progress and quality of life of rural population. The inadequacy of transportation infrastructure can dramatically reduce agricultural production and market opportunities and make population suffer from reduced cultural and social contacts as well as limiting business and employment opportunities. In the Land Transport Policy Framework (National Department of Transport, South Africa, 1996) it has been accepted that the existing South African land transport system is inadequate to meet the basic accessibility needs (to work, health care, schools, shops) in many developing rural and urban areas. The land transport plans in the rural context should be afforded much greater emphasis than they have received in the past and greater attention should be given to the determination of, and planning for, transport needs of rural communities.

The number of trips made within and outside the village by a rural community depends on its accessibility to the required services, amenities and facilities. A conventional transportation planning process based on travel demand would require an enormous quantity of travel data for all the settlements in a study areas, which would be a time consuming and expensive task. Further, even if travel data were collected and an origin-destination matrix formed, in most cases the intensity of trips would be so low that it would be almost impossible to justify construction of any road link or introduction of a bus system on this basis. Thus an activity-based method would be more appropriate for planning rural transportation systems. Travel behaviour is based on activities which people engage in, since travel-related activities represent the reasons for travel being needed. It can be designed to be qualitative and to be indicative of travel patterns and the transportation needs of the communities, looked at primarily from the point of view of access to activities and services. Thus the presence of non-transport interventions such as schools, water sources, medical facilities within or near the rural area, directly affect the transport demand of the community. These interventions usually fall within the wider spectrum of rural development planning. The accessibility level of a rural community cannot, therefore, be considered in isolation and there is need to promote rural development that would improve access to opportunities. It was emphasized in the integrated Rural Transport

Development Research Program (DOT, 1996) that the government departments, charged with ensuring the provision of physical infrastructures and services (transport, water, health, sanitation, schooling, etc.), develop strategies for responding to rural community needs, and calls for assistance from rural communities. There is also a need for these departments to figure out how to do this in an integrated fashion, i.e. undertaking planning which is informed of activities to other relevant departments.

Based on the above facts, the aim of this study has been set to develop an activity-based methodology to determine the travel needs of rural communities; and to quantify and prioritize the present overall accessibility levels of rural areas.

## **2. REVIEW OF LITERATURE**

It should be borne in mind that by comparison with other developing countries, little research has been carried out in South Africa in the field of rural transportation. Such literature as is available has been reviewed under two sub headings: studies carried out in other countries and studies carried out in South Africa. Lastly, based on the review, a few observations have been made on the kind of research required on rural accessibility in South Africa.

### **2.1 Studies carried out in other countries**

A very brief review is presented here on the analytical techniques which have been used to articulate the concept of accessibility, which leads to more appropriate later methods. The literature available is very extensive and the references given below are only examples of the work done up to the present.

The traditional approach was exclusively physical and was based on the geometric structure of communications i.e. road, rail and air networks. The accessibility of a place was the sum of the shortest path distances, via the network, between it and all other places in the system (Garrison, 1960). Then network analysis became popular and it was refined from time to time (Armstrong, 1972). When distance was qualified by the availability of transport services for non-car users, the simplest measure of accessibility was travel time (Forbes, 1964).

Further, the early concentration on accessibility to places had largely been replaced by accessibility to specific functions or activities such as work, shopping, schools, hospitals and recreational outlets (Breheny, 1974).

A number of authors identified accessibility with traffic flow (Savigear, 1967; Dalvi and Martin, 1976). They calibrated distance exponents according to observed flow patterns.

There could be little argument that the greatest problems were experienced by those without access to cars and that, particularly this applied to certain social groups in certain geographical situations (Passwell, 1973). Conventional transport policies tend to ignore the fact that different population groups had widely varying mobility and accessibility needs according to age, family role and stage in the life-cycle (Markovitz, 1971). Thus it had been argued that transport planning should be aimed at satisfying travel needs (Burkhardt and Eby, 1973). Transport networks could be planned to provide acceptable basic standards (Stanley, 1975) and public transport operations could be conducted at a minimum level of service (Peat Marwick and Mitchell, 1977).

A very important milestone in the development of valid measures of personal accessibility was the East Anglia Study (Moseley et al, 1977). The analysis emphasized the fundamental importance of accessibility to specific local activities or functions, defined social groups according to car ownership and time available for travel and then enumerated people's ability to avail themselves of these functions at suitable times and frequencies. A similar approach was used later on by other researchers (Nutley, 1989). A rather different approach was used (Farrington and Stanley, 1978) in another study, in which the constraints (social, economic, land use, transport), which prevent needs being satisfied by the prevailing transportation system, were identified.

In the early stages of rural transportation planning, it was widely believed that roads could catalyze rural development if there were enough good roads to ensure access to inputs and transport agricultural surpluses to markets. Consequently, in rural transportation planning large amounts of investment aimed at rural development were directed towards the provision of roads. However, the empirical evidence for the impact of rural transportation on rural development was extremely mixed and accordingly it was felt that rural development could be stimulated by factors other than improved transport.

Thus, it was felt necessary to look closer at the access needs and priorities of the rural population and to develop a coordinated and integrated set of interventions to meet its access needs. Consequently, the Integrated Rural Accessibility Planning (IRAP) emerged out of a continuous process of methodology development, which has been undertaken since 1980's in a number of countries such as Tanzania, Philippines, Bangladesh, Malawi and Zimbabwe (Affum and Farhad 1995; Barwell and Jonathan 1993; Connerley and Schroeder 1996; Edmonds et al, 1994; Howe 1983; Ahmed et al, 1995; Sieber 1996 and Ali-Nejadfard 1997). The process is linked to the local level planning framework and includes an initial training programme with the local authorities in which the concept of IRAP is explained and staffs are instructed on data collection procedure. This is followed by data collection, an analysis of the data and the development of a draft action plan. This is then discussed in a second training programme or a seminar where the data are validated with different stakeholders in the communities and where the process of prioritizing access interventions and allocation of investments is explained. The process is carried out in a participative manner and is owned by the stake-holders.

## ***2.2 Studies carried out in South Africa***

Even though some studies had been carried out in the past on South African rural road needs (Mitchell et al, 1980, Maree and Dehlen, 1994), rural road traffic model (Jordaan, et al, 1984), investment framework (Copley and Clark, 1985) and impact of construction of rural access road on the development of a rural area (Van As, 1992; Jordan, 1992), little work has been reported in the literature on the overall rural development based on the need and accessibility levels of the communities. This fact had been highlighted in a recent research report (DOT, 1996) as: Good information on rural areas (needs, economic potential, population, etc.) is scarce, because research into issues of development in rural areas has largely been neglected in South Africa.

A technique to measure accessibility of rural communities to the existing road network was developed (Jordaan and Jordaan 1992) and applied in three study areas, namely Lebowa, Gazankulu and KwaZulu. Accessibility was measured based on the distances to the nearest gravel road and to surfaced roads, condition of the direct access facility etc. These criteria were again related to other criteria indicating the level of development in the rural regions, based on availability of electricity, water supply, medical facilities etc. The

case studies showed low levels of development and high levels of inaccessibility in the rural areas.

A study was undertaken by the Southern African Bitumen and Tar Association (1993) to describe and estimate the extent of the road and street system in both rural and urban developing areas in South Africa to assess its adequacy and hence needs, taking cognizance of the perceived needs of the communities. In order to achieve this objective existing data on the South African road system, was examined, the extent of the road system in developing urban and rural areas was estimated, the condition of the road system was assessed, the expectations of the public and relevant associations were surveyed, norms of road provision in developing areas were reviewed and road needs in developing urban and rural areas were assessed.

A study was carried out (Mashiri and Pienaar 1994) in order to help government policy makers to make transportation investment decisions. Accordingly, in three rural areas, namely Lebowa, Gazankulu and KwaZulu, the transportation needs of the communities were determined and the ability of those communities to pay assessed. Based on the results of the study, it was suggested that there was need to strengthen local participation in problem definition and solution, to develop infrastructure on an incremental basis to accord with needs and funding levels, to institute network optimization and to set up a special funding allocation.

The contour method of determining accessibility (Jordaan, 1997) was used in Mokerong II area in Northern Province. Travel time by public transport was considered as the mobility parameter and the distance that could be traveled in 60 minutes was taken as the measure of accessibility. It was observed that about 48% inhabitants had unacceptable accessibility in the study area.

A study on enhancement of rural mobility (Bosman et al, 1997) was carried out on a pilot basis in the Northern District of Northern Province. It was found that poor accessibility to public transport services and the inability of residents to pay for such services (i.e. affordability) were the main factors restricting communities' mobility. In this case a distance of 3 km from roads used as public transport route was considered to be the indicator of accessibility. It was observed that the transport needs of the communities were so basic that virtually any upgrading of infrastructure, which would enable them to access

basic facilities, such as schools, clinics and social security payment points, would result in dramatic increase in mobility and improvement in the quality of life.

### **2.3 Observations from the review of literature**

The studies carried out on the accessibility of rural areas in South Africa had considered distances from roads, distances from bus route and total travel time as the criteria of measurement. However, recognition of the actual accessibility needs of rural populations leads to the identification of factors that affect their satisfaction: e.g. the location and level of services and facilities, the infrastructure used to reach facilities, ownership of means of transport and availability of transport services. Thus, it is necessary to look closer at the access needs and priorities of the rural population and to develop a coordinated, integrated set of interventions to meet its access needs. This requires an integrated rural accessibility planning methodology derived from the accessibility concept. The method should be a multi-sectoral and integrated approach that would enable local level planners to facilitate local development through diagnosis and promotion of the most cost-effective set of interventions to meet the actual needs of the rural population for access to goods, services and opportunities. The Integrated Rural Accessibility Planning (IRAP) process is a product of such an approach and has been used successfully in a number of countries, including a few in Southern Africa. However, to make the IRAP method a more convenient tool for the local level decision makers in South Africa, it would be appropriate if the accessibility levels of each settlement in an area could be quantified in the form of indices based on the availability of facilities and services in the surroundings and the importance put on those facilities by the residents. This would help to identify the most inaccessible areas and prioritize them on the basis of an accessibility index. Cost-effective remedial measures could then be suggested to increase the accessibility levels.

## **3. OBJECTIVES AND SCOPE OF THE PRESENT STUDY**

The objectives of the present study are to:

- (a) identify travel-based activities and their importance to different groups of people in rural areas; and

- (b) develop a methodology for quantifying and prioritize the accessibility levels of different rural areas.

The methodology is applied so as to determine the accessibility levels of a few selected rural areas and to show how it helps in identifying possible transport and non-transport interventions for increasing the accessibility levels of these areas.

#### 4. DETERMINATION OF OVERALL ACCESSIBILITY OF RURAL AREAS

Accessibility is interpreted at the local scale and at a personal level in terms of people's ability to gain access to certain facilities relative to the ability of the prevailing transport system to overcome the distance barriers involved. Thus the overall accessibility level (OAL) of a certain rural area or the section of the population of the area may be quantified as the composite index of various basic activity requirements:

$$OAL = \sum_{i=1}^N w_i v_i \quad (4.1)$$

where:

N = Number of basic activities required by individuals in the study area as obtained by interviewing the villagers.

$W_i$  = importance (weight) associated with the accessibility to the  $i$  th activity.

$V_i$  = present level of accessibility to the  $i$  th activity.

If the scale for weight associated with the service characteristics is set such that

$$\sum_{i=1}^N w_i = 1 \quad (4.2)$$

and the present level of accessibility is expressed with respect to unity, then the possible overall accessibility level (OAL) will range between 0 and 1. OAL values close to 1 indicate a very high level of accessibility, whereas that close to 0 indicate very poor accessibility levels.

By determining the OAL of different rural areas, it would be possible to compare the present accessibility level. This would enable policy decisions to be made on the kind of measures to be taken to increase the OAL of individual areas. Since the methodology is activity-based, it can be applied for the generation of both transportation and non-transportation related solutions. From analysis of the results, it may be concluded that the construction of a primary health care center in the area would be the most appropriate solution for increasing the overall accessibility level of the area.

## **5. CASE STUDY**

### **5.1 Introduction**

It was decided to carry-out the case study in the Northern Province because of its vast rural population. About 82.8 percent of the total population lives in rural areas, whereas the national average in South Africa is only 49.8 percent. The total area of the province is 116824 square km and had a population of 4.8 million in 1994 with a density of 41.3 persons per square km. After consultations with the officials of the provincial Department of Public Transport, it was decided that the project would be carried out on a pilot basis in a selected area encompassing a few villages in the Central Region of the province. The region is located at the heart of the Northern Province and contributes about 20 percent to the provincial economy. The growth prospect of the region has increased in recent times principally, by the decision to locate the provincial capital at Pietersburg and the increase in the trade and transport between South Africa and the rest of Africa through the National Highway (N1) passing through the region. It was decided to choose the study area under the Bochum – My Darling Transitional Local Council (TLC) in consultation with the officials of the council. The TLC has a population of 102560 and is divided into four wards. The study area for this project was chosen in Ward 4. It is located about 100 km from Pietersburg, the provincial capital and about 26 km from Bochum, the TLC head quarters. The nearest town is Dendron, which is 46 km away and has major shopping complexes and banking facilities. The area is connected by an earth road with the gravel road connecting Bochum with My Darling. The nearest paved road is at Bochum, which is 26 km away from the ward. All the roads in the ward are earth roads with poor maintenance and poor cross drainage facilities. A minibus route operates connecting the area with Bochum with a very limited service. In the absence of a proper time table, the passengers need to wait

for long periods at the stops. The average walking distance to minibuss stops is about 500m from residences. Because of poor road conditions, it becomes difficult for the minibusses to operate during rainy seasons. There is a taxi rank in Bochum, from where it is possible to go to other places like Dendron and Pietersburg. There are 15 villages in the ward and five of them, namely Galashen, Lemonside, Millbank, Miltonduff and Udney were considered for detailed analysis in this study. The names of the villages with their populations are shown in Table-5.1. All the villages are located close-by. Most of the houses in the villages have some adjacent land for subsistence farming. This has made the villages sparsely populated, which makes it difficult to provide services and makes the location of facilities far off.

**Table 5.1 : Population of the villages**

<b>Name of village</b>	<b>Population</b>
Galashen	1109
Lemonside	850
Millbank	926
Miltonduff	444
Udney	825

None of these villages have electricity connections. Thus fuel is a major problem. There is a mountain just behind the study area and the women and children walk about 4 to 5 km's to the other side of the mountain for the collection of firewood. Earlier the villagers needed to walk quite a long distance daily to fetch water from a spring on the mountain. However, now each village has been provided with a few water points. This has reduced the travel burden especially on the women and children. However, the points are not evenly distributed, in Galashen there are 22 water points whereas Udney has only 2. The school facilities are available in the area. However, because of the low density of population and the absence of proper transport facilities, sometimes the students need to walk a few km's to the school. The only post office and the crèche in the area are located in Udney and Miltonduff respectively. There are no clinics or doctors in any of the villages in the study area. The nearest clinic is at Buffelshock, which is located about 12 kms from the area. Hospital facility is available in Bochum. There are churches and pension points at Galashen, Millbank and Miltonduff. Court, administrative offices, tertiary educational facilities and police station are located in Bochum. The nearest university is at Pietersburg.

## **5.2 QUESTIONNAIRE DESIGN AND DATA COLLECTION**

### **5.2.1 Questionnaire format**

A village level survey was conducted to gather information regarding the existing infrastructural facilities and services available in the area (Appendix-I). The main objectives were to collect information on population, location of facilities and services, existing road condition and public transport services.

The travel behaviour study questionnaire was designed to obtain information mainly about the trip details of the family members, the importance put on easy accessibility to different activity centers by the respondents and the satisfaction levels with the existing accessibility levels (Appendix-II). The villagers were asked to express their opinion in the form of satisfaction levels with the accessibility to various activities. Distance to a facility is not the major factor provided the place is easily accessible. For example, a facility may be located 10 km away and well connected by road and frequent bus services. A person may take just 40 min. to reach the place including waiting time. The journey will also be comfortable and convenient. On the other hand, another facility may be located 3 km away at an isolated place with no proper road connection and transport services. In this case it may take more than 40 min for a person to reach there. The journey will not be comfortable and convenient. These factors will be reflected by the overall impression expressed by the respondents. The questionnaire was designed to be filled in by the interviewers from the responses by the respondents. Only questions that were relevant and relate to the objectives of the present study were included. Questions were mostly close ended, simple, direct and unambiguous. A few questions were designed to extract the details of the family including number of members with age group and gender, number of earning members, monthly income, vehicle ownership etc. These information were collected from the head of the household. A particular question was designed to know the importance put on the easy accessibility to different activities and the satisfaction with the existing accessibility levels for the activities performed by the members of the households. These data were collected separately from all the members present in the household during the time of survey. It is postulated that the relative rating is a function of real difference that exists between the accessibility levels. For small set of activities, it is generally assumed that the respondents can ordinaly rank these according to their importance. When the list is long, a paired comparison method is used to arrive at the importance ranking. However, to make it simple for the respondents to express their views on the importance of

easy accessibility, they were asked to respond against each activity on a five point scale:

5. very important,
4. important,
3. undecided,
2. not important
1. not very important.

Similarly, to know the satisfaction level with the existing level of accessibility, they were asked to respond on a five points scale:

- 5: highly satisfied,
- 4: satisfied,
- 3: undecided,
- 2: dissatisfied
- 1: highly dissatisfied.

The question was designed also to know the impact of improved transport facilities and the possibilities of migration by the residents. Space was left for the respondents for any additional remarks, which they wanted to make.

## **5.2 Data collection**

After the initial preparation of the questionnaire, it was distributed among a few members of the villages selected for the study and the officials of the Bochum- My Darling TLC for their comments. It was particularly necessary to know the activities generally performed by the residents in the locality. A few modifications were made after receiving feed back from them and finally the following activities were retained: Work, Shop, Market, Education/School, Clinic, Recreation, Church, Post Office/ telephone, Creche, Police station, Court/ Administration, Water source and Firewood source. Keeping in view the fact that the respondents might be sensitive to the question on income, it was decided to ask for the income ranges only.

Interviewers were selected from the study area for carrying out the home interview survey. Before starting the data collection process, the interviewers were explained about the objectives and importance of the study and were trained by the study team on the procedure of data collection. One complete day was spent on this exercise. The interviewers were asked to explain the purpose of the survey to the respondents in the beginning. The interview was conducted on one village at a time. At least one person from the research team was always present to guide the interviewers in case of any doubts and difficulties. At the end of a day, the data collected by different persons were checked. In case of some abnormal responses, the concerned interviewers were sent back the next day to verify.

To decide about the sample size, the population of each village in the study area was considered. A preliminary survey in a few randomly selected households in the area showed that the average household size was about 7. Accordingly the number of households in a village was determined. The main objective of the case study was to apply the technique of quantification developed in the study. Keeping in view the resource, time and other constraints, it was decided to carry out survey on about 30 households in each village. Most of the villages were found to be quite large in area with low density of households. The details of village-wise data collected for the study is shown in Table 5.2. Miltonduff being a small village shows a high percentage of households being interviewed. Houses to be interviewed in a village were chosen arbitrarily according to house number to prevent any bias.

**Table 5.2: Details of Village-wise data collection**

<b>Name of village</b>	<b>Population</b>	<b>Number of households</b>	<b>Number of households interviewed</b>	<b>Percentage of households interviewed</b>
Galashen	1109	159	28	17.6
Lemonside	850	122	26	21.3
Millbank	926	133	28	21.1
Miltonduff	444	64	28	43.7
Udney	825	118	28	23.7

### **5.3 INFERENCES FROM SOCIOECONOMIC CHARACTERISTICS**

The data obtained from primary survey through questionnaires are analyzed under several categories and is presented in the following paragraphs.

#### **5.3.1 Distribution by Gender and marital status, family sizes and age group**

The gender distribution of the respondents in percent representing the heads of the households is shown in Table 5.3. The numbers within bracket against each village represent the number of respondents. Except for Millbank, it shows more female respondents than male and at Miltonduff the male response is very low with only 25 percent. The main reasons for a household being headed by a female are because the woman is separated or divorced or the male partner has migrated out of the area in search of work. Marital status of respondents show that most of them are married (Table 5.4) ranging between 57.1 percent in Miltonduff and 75 percent in Udney. The percentage of single respondents ranges between 11.5 in Lemonside and 21.4 in Miltonduff. The number of separated respondents was none at Galeshen, Lemonside and Udney and 3.6 percent at Millbank and Miltonduff. The number of widowed respondents varies between 7.1 and 23.1 percents. The family size distribution of the households show that for most of the households in all the five villages it ranges between 5 and 8 (Table 5.5). Very few households have member between 1 and 2. Gender-wise age group distribution in percent in all the five villages is shown in Table 5.6. In most of the cases the percentage of female population is higher than the male population. This partly explains why the number of female respondents was more in the household questionnaire survey. The age group distribution data helps to project the future travel demands in the communities. A closer look into the table shows that a large proportion of the population is of school going age at present (53.84 percent in Udney). In a normal situation all of them should go to school. Thus the provision of easy accessibility to schools is expected to cater the travel needs of a large proportion of the population.

**Table 5.3: Percentage Distribution of Respondents by Gender**

<b>Gender</b>	<b>Galashen (28*)</b>	<b>Lemonside (26*)</b>	<b>Millbank (28*)</b>	<b>Miltonduff (28*)</b>	<b>Udney (28*)</b>
Male	42.9	42.3	53.6	25.0	46.4
Female	57.1	57.7	46.4	75.0	53.6

\* Total number of respondents

**Table 5.4: Percentage Distribution of Respondents' Marital Status**

<b>Marital status</b>	<b>Galashen (28*)</b>	<b>Lemonside (26*)</b>	<b>Millbank (28*)</b>	<b>Miltonduff (28*)</b>	<b>Udney (28*)</b>
Single	17.9	11.5	17.9	21.4	14.3
Married	67.8	65.4	71.4	57.1	75.0
Widowed	14.3	23.1	7.1	17.9	10.7
Separated	0.0	0.0	3.6	3.6	0.0

\* Total number of respondents

**Table 5.5: Percentage Household Size Distribution**

<b>Family size</b>	<b>Galashen (28*)</b>	<b>Lemonside (26*)</b>	<b>Millbank (28*)</b>	<b>Miltonduff (28*)</b>	<b>Udney (28*)</b>
Between 1 and 2	7.1	11.5	7.1	3.6	7.1
Between 3 & 4	14.3	26.9	10.7	25.0	7.1
Between	35.7	19.3	32.1	35.6	28.6

5 & 6					
Between 7 & 8	25.0	30.8	39.4	17.9	39.3
More than 8	17.9	11.5	10.7	17.9	17.9

**Table 5.6: Distribution of gender and age group in percentage**

Age group	Galashen (28*)		Lemonside (26*)		Millbank (28*)		Miltonduff (28*)		Udney (28*)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Below 6	7.14	8.24	8.55	7.89	6.81	11.0	6.92	10.06	7.41	10.58
6 to 11	10.44	8.24	9.87	10.53	9.42	5.76	8.18	9.43	7.41	8.47
12 to 15	6.59	9.89	6.58	3.95	6.81	7.85	6.29	3.77	4.23	7.94
16 to 20	8.24	10.44	6.58	11.84	5.76	8.38	7.55	5.67	4.23	10.05
21 to 49	5.49	10.44	5.26	15.79	6.28	14.14	11.32	15.09	8.47	14.81
50 to 59	3.85	4.95	3.29	3.29	5.23	7.33	4.40	5.66	5.29	5.29
60 and above	2.75	3.30	2.63	3.95	1.57	3.66	1.89	3.77	3.17	2.65

\* Total number of respondents

### 5.3.2 Distribution by Economic Status

The economic status of a family can be studied in terms of number of earning members, the occupation level and income of a respondent and the vehicle ownership of the family. These are now discussed in the following paragraphs. The majority of the households is having one earning member (Table 5.7). A substantial proportion of households in all the villages show the absence of any earning member with as high as 28.6 percent in Millbank and Miltonduff. Most of the households in the area have plots of land adjacent to each house which is being used for subsistence farming. Some times they

collect other necessary items from the local shop in exchange of their produce. The number of school going children in the area is high because of the presence of a number of schools in the locality (Table 5.8). The number of households with no child going to school is low with 7.7 percent in Lemonside, 3.6 percent in Miltonduff and Udney and none in Galashen and Millbank. The schools are not always very close by, but are accessible.

**Table 5.7: Percentage Distribution of Earning Members in the Households**

<b>Earning Household members</b>	<b>Galashen (28*)</b>	<b>Lemonside (26*)</b>	<b>Millbank (28*)</b>	<b>Miltonduff (28*)</b>	<b>Udney (28*)</b>
Nil	21.4	23.1	28.6	28.6	14.3
1	57.2	61.5	60.7	57.1	53.6
2	21.4	3.8	10.9	14.3	21.4
3	0.0	3.8	0.0	0.0	7.1
More than 3	0.0	3.8	0.0	0.0	3.6

**Table 5.8: Percentage of Student in the households**

<b>Number of students</b>	<b>Galashen (28*)</b>	<b>Lemonside (26*)</b>	<b>Millbank (28*)</b>	<b>Miltonduff (28*)</b>	<b>Udney (28*)</b>
Nil	0.0	7.7	0.0	3.6	3.6
Between 1 & 2	17.9	30.8	35.7	39.3	21.4
Between 3 & 4	39.3	26.9	39.3	39.3	46.4
Between 5 & 6	28.5	34.6	17.9	14.2	21.4
More than 6	14.3	0.0	7.1	3.6	7.2

A large majority of the persons are employed in industries and public sector (Table-5.9). Very few are in mining, agriculture and live stock farming. There are only few shops in the area and thus few shop owners. The monthly income range is low. Very few households are having monthly income of more than Rands 500 (1 Rands approximately equal to Rs. 8) as shown in Table-5.10. Vehicle ownership in the villages show that wheel barrows and animal drawn vehicles are very popular and mainly used for carrying goods (Table 5-11). The car ownership rate is not very high and they are being used sometimes for carrying goods as well. The ownership of bicycles is also quite low. In absence of proper public transport system and because of the distance between the facilities, it was expected that the ownership of bicycles would be high. However, the absence of proper roads may be the reason for low ownership of bicycles.

Udney and Lemonside are two adjacent villages at the foothills of a mountain range. The main road ends there. This road is connected to the major road connecting two towns. Being adjacent villages, a number of facilities are available nearby within walking distances. Also there is a minibus route connecting the villages with the nearest town. Whereas the other villages, namely Galashen, Millbank and Miltonduff are not located by the side of the main road and are scattered over a reasonably large area. All the activity centres are not available in one village and thus the residents need to travel to other places to meet their needs. These distances are not always possible to travel by walking and the residents are forced to own personal vehicles. This

explains the high car ownership in these villages even though the income levels are comparatively low.

**Table 5.9: Percentage distribution by occupation**

Occupation	Galashen (22)*	Lemonside (21)*	Millbank (21)*	Miltonduff (25)*	Udney (26)*
Public sector	18.2	33.3	42.9	8.0	19.2
Agriculture	0.0	0.0	0.0	12.0	3.8
Livestock farming	18.2	0.0	9.5	8.0	7.7
Industry	54.5	47.6	33.3	56.0	65.5
Mining	0.0	4.8	0.0	4.0	0.0
Shop Owner	0.0	0.0	4.8	8.0	3.8
Others	9.1	14.3	9.5	4.0	0.0

**Table 5.10: Monthly Income Distribution in percent of the households (Rands)<sup>+</sup>**

Household income range	Galashen (28*)	Lemonside (26*)	Millbank (28*)	Miltonduff (28*)	Udney (28*)
Nil	21.4	19.2	25.0	10.7	7.1
Below 300	32.1	38.5	32.1	39.3	28.6
Between 301 – 500	35.8	34.6	39.1	32.1	50.0
Above 500	10.7	7.7	3.6	17.9	14.3

+ Rand was approximately equal to Rs. 8/- in 1998

\* Total number of respondents

**Table 5.11: Percentage Vehicle Ownership Levels**

<b>Vehicle type</b>	<b>Galashen (28*)</b>	<b>Lemonside (28*)</b>	<b>Millbank (28*)</b>	<b>Miltonduff (28*)</b>	<b>Udney (28*)</b>
Wheelbarrow	3.6	23.1	28.6	82.1	46.4
Animal-drawn vehicle	39.3	0.0	21.4	17.6	39.3
Car	17.6	3.8	14.3	25.0	17.9
Bicycle	3.6	3.8	0.0	17.9	28.6

\* *Total number of respondents*

#### **5.4 DETERMINATION OF THE WEIGHTS OF THE ACTIVITIES**

In order to determine the weights of different activities the data collected through the household interview survey was utilized. The analysis was carried out village-wise. It has already been mentioned that the respondents were asked to rate each activity on a five point scale, accordingly they were free to give any weight between 1 and 5 against each activity. The calculated weighted average was considered to reflect the weight of a particular activity as perceived by the respondents. Accordingly weights of all the thirteen activities were calculated for all the five villages separately. However the weights were rationalized for each village to satisfy Equation 4.2 by dividing each weight by the summation of the weights scored by all the activities. Finally, the weights as obtained by combining data from all the villages are also calculated (Table 5.12).

From the table, it may be observed that access to water source, firewood source, clinic, church and education have scored very high in all the villages. Access to police station and court/administration are not considered very important compared to other activities. This may be explained by the fact that these activities are not performed on a regular basis and sometimes they are not required to be performed at all for years together. The weights calculated combining data from all the villages show similar scores with those of the five villages individually. This is because of the fact that all the villages are from

the same locality having similar infrastructure and the socio-economic conditions. Thus it is decided to consider the weights as obtained from combined data of all the villages, for subsequent calculations.

## **5.5 DETERMINATION OF SATISFACTION LEVELS WITH THE PRESENT ACCESSIBILITY TO ACTIVITIES**

The levels of satisfaction with the present accessibility levels are calculated from the data collected through household questionnaire survey from all the members present in the households during the interview. In the related question, the respondents were asked to fill up the rows against only those activities in which they were personally involved. For example, a housewife does not go to work, thus she need not provide the data on work trips. In this study it is observed that none of the 198 respondents interviewed in five villages needed to visit police station and court/administration. Thus no data was available on these two activities even though the respondents put some importance on these activities as can be seen in table 5.11. accordingly, it was decided to delete these two activities and calculate the accessibility based on the remaining 11 activities. To do this the weights of different activities are recalculated based on the eleven activities only. The weighted average of the satisfaction levels are calculated against each activities only. The weighted average of the satisfaction levels are calculated against each activity for each village separately. However, to normalize the scores the values are divided by 5 (the maximum possible score) so that the maximum possible satisfaction level may be 1 with the range varying between 0 and 1. The scores as obtained and the recalculated weights are shown in Table 5.13. No data was available on recreation trips for Miltonduff and thus it was not possible to come up with the related value of satisfaction level. For all the villages, it is observed that the satisfaction level with accessibility to fire wood are very poor. This is because of the fact that none of the villages are connected with electricity and no an average the villagers need to walk 4 to 5 km's to collect fire wood.

## **5.6 CALCULATION OF THE LEVEL OF ACCESSIBILITY**

Based on the weights and satisfaction levels with accessibility to different activities obtained as shown in Table 5.13, the levels of accessibility are calculated for the five villages in the study area using Eq 4.1. The scores are obtained as shown in Table 5.14. It shows that Lemonside has comparatively

the highest level of accessibility with a score of 0.549 whereas, Udney has the lowest with 0.364. In view of the fact that the maximum possible value is 1, it may be concluded that the accessibility levels of all the villages are poor. It may be noted that these values are not absolute values, but they help to compare the accessibility levels among villages.

**Table 5.12: Importance scale of easy accessibility to different activity centers**

	<b>Galashen (28)*</b>	<b>Lemonside (26)*</b>	<b>Millbank (28)*</b>	<b>Miltonduff (28)*</b>	<b>Udney (28)*</b>	<b>All combined (138)*</b>
Work	0.072	0.088	0.083	0.077	0.072	0.076
Shop	0.079	0.065	0.079	0.076	0.083	0.078
Market	0.066	0.071	0.067	0.060	0.070	0.067
Education	0.093	0.088	0.087	0.085	0.092	0.089
Clinic	0.088	0.067	0.094	0.089	0.082	0.086
Recreation	0.074	0.067	0.064	0.070	0.077	0.072
Church	0.088	0.084	0.076	0.080	0.080	0.082
Post Office/ Telephone	0.069	0.071	0.066	0.073	0.071	0.070
Crèche	0.073	0.074	0.075	0.079	0.069	0.073
Police Station	0.061	0.065	0.064	0.066	0.063	0.063
Court/ Administration	0.055	0.062	0.059	0.069	0.062	0.061
Water source	0.099	0.109	0.102	0.099	0.100	0.101
Firewood source	0.083	0.089	0.084	0.077	0.079	0.082

\* Total number of respondents

**Table 5.13: Satisfaction Levels with the present accessibility to various activities**

	<b>Weight</b>	<b>Galashen</b>	<b>Lemonside</b>	<b>Millbank</b>	<b>Miltonduff</b>	<b>Udney</b>
Work	0.085	0.400	0.320	0.680	0.534	0.200

Shop	0.090	0.733	0.704	0.766	0.675	0.656
Market	0.076	0.200	0.886	0.200	0.200	0.200
Education	0.102	0.541	0.582	0.343	0.400	0.566
Clinic	0.098	0.224	0.342	0.263	0.400	0.277
Recreation	0.082	0.533	0.800	0.800	-	0.400
Church	0.093	0.707	0.578	0.800	0.629	0.618
Post Office	0.080	0.200	0.300	0.200	0.800	0.280
Crèche	0.084	0.800	0.680	0.720	0.680	0.400
Water source	0.115	0.330	0.642	0.470	0.626	0.395
Firewood source	0.093	0.241	0.250	0.253	0.248	0.219

\* No data was available from Miltonduff on recreational trips

**Table 5.14: Overall levels of accessibility**

Village	Galashen	Lemonside	Millbank	Miltonduff	Udney
Overall accessibility Level	0.446	0.549	0.498	0.476	0.364

## 5.7 IMPACTS OF POOR ACCESSIBILITY ON THE RESIDENTS

The poor transport accessibility levels affect the willingness of the villagers to travel further to improve their living conditions. The majority of the respondents in all the villages indicated that they would like to travel further (Table 5.15). On the question of how the ability to travel further would help, the respondents had multiple choice among three reasons as shown in Table 5-16. The major reason sighted is to increase the income levels by taking products/services in bigger market. Some of them felt that a better accessibility level would give them chance to commute to work at far off places. A sizable proportion of the respondents felt that better accessibility would help them to undergo further education. The most disturbing

phenomenon is the willingness of the respondents in all the villages to leave the area permanently because of poor accessibility levels to basic facilities (Table 5.17). In Udney and Galashen, as high as 55 and 53 percent respectively are willing to leave. However, a majority of the people, who is willing to leave, thought that accessibility to facilities is a problem rather than the lack of opportunities (Table 5.18).

**Table 5.15: Percentage of respondents that would like to travel further**

<b>Response</b>	<b>Galashen (45)*</b>	<b>Lemonside (37)*</b>	<b>Millbank (28)*</b>	<b>Miltonduff (33)*</b>	<b>Udney (47)*</b>
Yes	60.0	68.0	54.0	55.0	68.0
No	40.0	32.0	46.0	45.0	32.0

\* *Total number of respondents*

**Table 5.16: Response to the advantages of improved access (Percent)**

<b>Advantages of improved access</b>	<b>Galashen (30)*</b>	<b>Lemonside (25)*</b>	<b>Millbank (19)*</b>	<b>Miltonduff (22)*</b>	<b>Udney (35)*</b>
Take product/ service to bigger market	40	60	68	68	49
Commute to work	13	20	11	14	2
Undergo further education	47	20	21	18	49

\* *Total number of respondents*

**Table 5.17: Willingness to emigrate (Percentage)**

<b>Response</b>	<b>Galashen</b>	<b>Lemonside</b>	<b>Millbank</b>	<b>Miltonduff</b>	<b>Udney</b>
-----------------	-----------------	------------------	-----------------	-------------------	--------------

	<b>(45)*</b>	<b>(37)*</b>	<b>(28)*</b>	<b>(33)*</b>	<b>(47)*</b>
Yes	53	35	43	27	55
No	47	65	57	73	45

\* Total number of respondents

**Table 5.18: Reasons for willingness to emigrate (Percentage)**

<b>Reasons for emigrating</b>	<b>Galashen (24)*</b>	<b>Lemonside (13)*</b>	<b>Millbank (22)*</b>	<b>Miltonduff (9)*</b>	<b>Udney (26)*</b>
Lack of opportunities in the region	38	38	25	44	42
Lack of accessibility to opportunities	62	62	75	56	58

\* Total number of respondents

## **5.8 IDENTIFICATION OF MEASURES TO INCREASE THE ACCESSIBILITY LEVELS OF THE VILLAGES**

It has already been shown (Table 5.14) that the overall accessibility levels of all the villages in the study area are poor. It not only identifies the villages with poor accessibility but also prioritizes them. The methodology developed in this study helps to suggest the measures to be taken to increase the overall accessibility of a selected village or the study area as a whole. It would be appropriate if the activities are considered one by one in descending order of their weights. The impact on overall accessibility level will be the highest with a unit increase in accessibility level to the activity with highest weight. In this study the accessibility to water source has been given the highest weight with a value of 0.115 by the respondents as shown in Table 5.13. However, the satisfaction levels with existing levels have been found to be poor in

Galashen, Millbank and Udney with values of 0.330, 0.470 and 0.395 respectively. One way to increase these values is to provide better accessibility to water sources, which can be achieved by providing a few more water points in the villages or by providing better transport facilities to the existing water points. Better transport facilities may be provided by better roads and provision of motorized or non-motorized vehicles. Accessibility levels to schools (with weight of 0.102) are poor in Millbank and Miltonduff with values of 0.343 and 0.400, respectively and are not very high in the other three villages. Thus, there is a need to increase the accessibility levels to schools in all the villages. Easy accessibility to clinic is also given high weight (0.098), and the present accessibility levels of all the villages are found to be poor in absence of any clinic in the region. Accessibility to church and firewood source are weighed equally by the respondents with a value of 0.093. The levels of satisfaction with accessibility to church are found to be quite satisfactory, whereas those to firewood source are very poor in all the villages. This shows that there is an urgent need to provide fuel source, which may be in the form of supply of electricity connection in the villages or provision of better transport system to the source. In this way, it is possible to identify the necessities in the villages against all the activities. Since the weights, satisfaction levels and overall accessibility levels are expressed numerically, the methodology helps the policy and decision makers to numerically calculate the extent of improvement measures necessary against each activity to provide a certain level of overall accessibility to the villages.

Increase in the level of accessibility to activity centers may be achieved by establishing new facilities or improving the transportation systems to the existing facilities. To make a final decision on the increasing of overall accessibility of a place, factors such as the available resources and cost-effectiveness of the alternatives are to be determined. It will not be cost effective to provide all the facilities in a village. For example, the total demand in a small village may not justify the establishment of a post office, which is not being used on a daily basis by the residents. Thus location of such facilities may be considered on a regional basis. On the other hand, demands for water, firewood and school are such that, if possible, the facilities should be provided in each village. There is a need to develop a methodology to optimally locate the new facilities so that the overall levels of accessibility of maximum number of villages in the area may be improved.

## **6. CONCLUSION**

The study showed that the accessibility to basic needs in the study area is highly inadequate. The respondents indicated higher importance ratings on accessibility to water source, fire wood source, educational facilities and health care centres compared to other facilities and services considered in the study. However, the present accessibility levels to shop, church and crèche were found to be satisfactory in all the villages.

The technique used for the quantification of accessibility levels based on responses from the villagers on the importance of activities and the satisfactions on the existing infrastructure and service helps to identify the problems and prioritize them. This helps the local level planners to suggest alternative interventions to increase the accessibility level in the selected village or a group of villages. The method ensures the participation of the local people in the planning process. However, the effectiveness of the method will largely depend on the sampling method used during data collection process.

## **7. REFERENCES**

Affum, Joseph and Farhad Ahmed; 1995; Use of GIS as a Decision Making Tool in Integrated Rural Transport Planning; University of South Australia.

Ahmed F, S Carapetis, M Taylor; 1995; Rural Transport in Bangladesh: Impact of Non-motorized Transport on Household's Activity Patterns; Paper presented at the International Conference of the Eastern Asia Society of Transport Studies, Manila, September 28-29.

Ali-Nejadfard F; 1997; Rural Travel and Transport Planning and Transport Related Interventions: A Case study in Malawi; Proceedings of the South African Transport Conference, Johannesburg.

Armstrong HW; 1972; A Network Analysis of Airport accessibility in South Hampshire; Journal of Transport Economics and Policy, V-6, pp: 294-307

Barwell I and Jonathan Dawson; 1993; Roads Are Not Enough: New Perspectives on Rural Transport Planning in Developing Countries; IT Publications, London.

Breheeny MJ; 1974; Towards Measures of Spatial Opportunity; Progress in Planning, V-2, No. 2.

Bosman J, Barnard MM and Badenhorst H; 1997; Enhancement of Rural Mobility in South Africa; Proceedings of the South African Transport Conference, Vol. 3C.

Burkhardt JE and Eby CL; 1973; need As a Criterion for Transportation Planning; Highway Research Record, V-435, pp: 32-41.

Connerly E and Larry Schroeder; 1996; Rural Transport Planning; Approach Paper, SSTP Working Paper No. 19, The World Bank, Washington, D.C.

Copley PJ and Clark P; 1985; The Application of Central Place Theories in Northern Natal/KwaZulu: Towards a Rural Road Investment Framework; Technical Report: RT/30, National Institute for Transport and Road Research, CSIR.

Dalvi MQ and Martin KM; 1976; The Measurement of Accessibility: Some Preliminary Results; Transportation, V-5, pp: 17-42.

DOT (Department of Transport); 1996; Integrated Rural Transport Development Research program; Project Report No.: CR-96/023, Pretoria, South Africa.

Edmonds G, Donnges C and Palarca N; 1994; Planning for People's Needs; ILO/DIGL, Manila.

Farrington JH and Stanley PA; 1978; Public Transport in Skye and Lochalsh; Department of Geography, University of Aberdeen.

Forbes J; 1964; Mapping Accessibility; Scottish Geographical magazine, V-80, pp: 12-21.

Garrison WL; 1960; Connectivity of Interstate Highway System; Papers of the Regional Science Association, V-6, pp: 121-137.

Howe, J; 1983; Conceptual Framework for Defining and Evaluating Improvements to Local Level Rural Transport in Developing Countries; ILO, Geneva.

Jordaan PW; 1992; The Developmental Impacts of Rural Roads: The Kei Mouth Case Study; Proceedings of the Annual Transport Conference, Vol-4A.

Jordaan PW 1997; Measuring Accessibility: A Case Study in the Northern Province; South African Transport Conference, Vol.4A.

Jordaan PW and Jordaan C; 1992; Accessibility of Rural Areas: The Facts; Project Report PR: 92/074/1, South African Roads Board.

Jordaan PW, Crous WW and Van Tonder CA; 1984; The SA Rural Road Traffic Model; Proceedings of the Annual Transport Conference, Vol: H(S.343).

Maree JH and Dehlen G; 1994; Road Needs in Developing Rural and Urban Areas; Proceedings of the Annual Transport Conference, Vol: 4A.

Markivitz JK; 1971; Transportation Needs of the Elderly; Traffic Quarterly, V-25, pp: 237-253.

Mashiri MAM and Pienaar PA; 1994; A Transportation Provision Strategy for Rural Communities; Proceedings of the Annual Transportation Conference.

Mitchell MF, Jordaan PW and Taute A; 1980; Perspectives on South African Rural Road Needs; Proceedings of the Annual Transport Conference, Vol-5B.

Moseley MJ, Harman RG, Coles OB and Spencer, MB; 1977; Rural Transport and Accessibility; Center of East Anglian Studies, University of East Anglia, Norwich.

National Department of Transport; 1996; Land Transport Policy Framework, Pretoria, South Africa.

Nutley SF; 1989; The Evaluation of Accessibility Levels in Rural Areas- An Example from Rural Wales; Dimensions of Rural Transportation, Inter-India publications, New Delhi.

Passwell RE; 1973; problems of the Car-less in the United Kingdom and the United States; Transportation, V-2.

Peat M and Mitchell C; 1977; An Initial Report on Minimum Levels of Service for Rural Public Transport; Prepared for National Bus Company, London.

Savigear F; 1967; A Quantitative measure of Accessibility; Town Planning Review, V-38, pp: 64-72.

SABITA; 1993; Social Development Issues: Road Needs in Developing Area; Summary Report.

Sieber K; 1996; Rural Transport and Regional Development: the Case of the Makete District, Tanzania; Karlsruhe Papers in Economic Policy Research, V-4, Nomos Verlag, Baden-Baden.

Stanley PA; 1975; Defining Minimum Socially Acceptable Levels of Mobility in Rural Areas; Paper for IBG Transport Geography Study Group Conference, Birmingham.

Van AS SC; 1992; The Impact of an Access Road on the Development of a Rural Area (Before study); Interim Report PR: 91/458/1, Department of Transport.

APPENDIX I

**Village Accessibility Study  
Questionnaire for Village Level Data Collection**

---

Name of interviewer:.....

Date:.....

Village:.....

Province:.....

---

Note to interviewer: *The data is to be collected in a meeting where the representatives of all the stakeholders of the village are present. In a separate sheet write down the names of all the persons present with the organizations they represent.*

---

**1. Number, names and location of the settlement that make up the village:**

.....  
.....  
.....  
.....  
.....

**2. Number of households in the village: .....**

**3. Population of the village: .....**

**4. Availability of electricity in the village:  Yes  No**

**If yes**

**4.1 How many houses have electricity connection (in % or in number): ... ..**

**If no**

**4.2 Other fuels used for cooking: .....**

**4.3 If firewood is being used, its source with distance:**  
.....

**5. Availability of drinking water supply in the village: [ ] Yes [ ] No**

**If yes**

**5.1 Number of houses with water connection (in % or in number):**  
.....

**5.2 Number of tap connections for community use: .....**

**If no**

**5.3 Nearest source of water with distance: .....**

**6. Activity centres in the surroundings: (Some of the activities may be irrelevant for a village. For example, if water supply is there in every household, the presence of other water source is irrelevant. In such cases the respective rows may be left blank)**

Activity centres	Frequency of travel*	Within village	Outside village**	Distance in km	Mode/s used to reach	Travel time (min)
Shop						
Market						
Major shopping complex						
Primary School						
Secondary School						
Tertiary Institute						
Clinic/ Doctor						

Hospital						
Court						
Pension Point						
Post office/ Telephone						
Bank						
Church						
Creche						
Police station						
Administrative offices						
Court						
Water source						
Firewood source						

*\* It may be difficult to provide the frequency in terms of days, weeks or months. It is suggested that the frequency be represented in a scale ranging between 1 and 5, a value of 1 would mean not too frequent and a value of 5 will mean too frequent.*

*\*\* Indicate name of the place*

## **7. Road/ Street survey:**

- 7.1 Kinds of roads within village:**  Earth road  
 Gravel road  
 Surfaced road  
 Combination of above three

**7.2 If it is combination of earth, gravel and surfaced roads, write the length of each kind (may express in % as well):**

Earth road: .....

Gravel road: .....

Surfaced road: .....

**7.3 Condition of the roads within the village:**

**7.3.1 Road Maintenance:**  Good  Poor  None

**7.3.2 Cross drainage:**  Good  Poor  None

**7.4 If there are no gravel and surfaced roads within the village, then:**

**7.4.1 Distance of the nearest gravel road from the village: ....**  
..... km

**7.4.2 Distance of the nearest paved road from the village: .....**  
.....km

**8. Public transportation (Bus/ Minibus) survey:**

**8.1 Name of the nearest town/city: .....**

**8.2 Distance of the nearest town/city from the village:**  
.....

**8.3 Modes generally used by the villagers for going to the nearest town/city:**

.....

**8.4 Is it possible to reach the nearest town/ city directly by bus/ minibus without transfer?:**

Yes  No

**8.5 Distance of the nearest bus/ minibus stop/ stand: .....**

**8.6 Average total travel time (including wait and travel):**

.....

**8.7 Availability whenever needed during the day:** [ ] Yes [ ] No

**8.8 Average waiting time at the stop:** .....min.

**9. Rough sketch of the village boundary with existing roads and activity centres inside and outside the village:**

APPENDIX-II

**Travel Behaviour Study**

**Household Interview Questionnaire:**

---

Interviewer:.....

Date of survey:.....

Interview No.:.....

Village:.....

Locality:.....

House No.:.....

---

Note to the interviewer: *Explain the purpose of the interview. Clarify that the households have been selected at random so that the interviewees have no worries or concern about why he or she has been selected. Also, assure that the data will be dealt with strict confidentiality and only be used for research purposes.*

---

**1. Household composition:**

**1.1 Present head of the household:**

1

[ ] Male

2

[ ] Female

**1.2 Marital status:**

- 1      Single
- 2      Married/ Living together
- 3      Widowed
- 4      Divorced
- 5      Separated

**1.3 Total number of persons presently living in the household:**

Between 1 and 2 <i>1</i>	Between 3 and 4 <i>2</i>	Between 5 and 6 <i>3</i>	Between 7 and 8 <i>4</i>	More than 8 <i>5</i>

**1.4 Number of earning members in the household:**

<i>1</i> Nil	<i>2</i> 1	<i>3</i> 2	<i>4</i> 3	<i>5</i> More than 3

**1.5 Number of school/ college/university going members in the household:**

1 Nil	2 Between 1 and 2	3 Between 3 and 4	4 Between 5 and 6	5 More than 6

**1.6 Age group of the household members:**

Age Group (years)	1 Number of male	2 Number of female
1 Below 6		
2 6 to 11		
3 12 to 15		
4 16 to 20		
5 21 to 49		
6 50 to 59		
7 60 and above		

**2. Occupation, income and vehicle ownership:****2.1 Number of formally employed members (put the numbers in the appropriate boxes):**

- 1 Public Sector [ ]  
 2 Agriculture [ ]  
 3 Live stock farming [ ]

- 4 Industry [ ]
- 5 Mining [ ]
- 6 Other (specify) [ ]

**2.2 Number of self-employed members** *(Put the numbers in the appropriate boxes):*

- 1 Shop owner [ ]
- 2 Small manufacturer [ ]
- 3 Casual labour [ ]
- 4 Farming [ ]
- 5 Animal husbandry [ ]
- 6 Other (specify) [ ]

**2.3 Number of non-employed earning members** *(Put the numbers in the appropriate boxes):* 3

- 1 Pension [ ]
- 2 Remittance [ ]
- 3 Charities [ ]
- 4 Other (specify) [ ]

**2.3 Total monthly income range of the household (Rands):**

**2.3.1 Monthly cash income range:**

1 Nil	2 Below 300	3 Between 301-500	4 Between 501-900	4 Between 901-1500	5 Over 1500

**2.3.2 Monthly income range in kind** (*the interviewer will have to assess in terms of money*):

Nil 1	Below 300 2	Between 301-500 3	Between 501-900 4	Between 901-1500 4	Over 1500 5

**2.4 Vehicle and cart ownership of the household:**

Vehicle type	Number 1	Condition* 2	Used for		
			Passenger travel 3	Carry goods 4	Both 5
1 Car					
2 Motorcycle/ Scooter					
3 Bicycle					
4 Wheelbarrow					
5 Animal drawn cart					
6 Other ( <i>Specify</i> )					

\* 1 for Running and 2 for Not running conditions

**Note to the interviewer:**

**For Question number 3, data is to be collected from each member of the household separately.**

**3. Individual transport activity profile:**

**3.1 Interviewee number in the household:** .....

- 3.2 Age group of the member:**
- 1     Below 6
  - 2     6 to 11
  - 3     12 to 15
  - 4     16 to 20
  - 5     21 to 49
  - 6     50 to 59
  - 7     60 and above

- 3.3 Sex of the member:**
- 1     Male
  - 2     Female

**3.4 Status of the member:**

Formally employed 1	Self employed 2	Pensioner 3	Unemployed 4	Housewife 5	Student 6

**3.5 Importance of easy accessibility to different activity centres:**

	Very important 1	Important 2	Can not say (undecided) 3	Not important 4	Not very important 5
1 Work					
2 Shop					
3 Market					
4 Education/ school					
5 Clinic					
6 Recreation					

7 Church					
8 Post office/ telephone					
9 Creche					
10 Police station					
11 Court/ Administration					
12 Water source					
13 Firewood source					

3.6 Trip details:

Satisfaction with accessibility levels

Activity	Frequency 1	Inside/ outside Village* 2	Travel Mode/s 3	Travel Distance (Km) 4	Total travel time (min) 5	Total travel cost (R) 6	Highly satisfied 7	Satisfied 8	Undecided 9	Dissatisfied 10	Highly Dissatisfied 11
1 Work											
2 Shop											
3 Market											
4 Education/ school											
5 Clinic											
6 Recreation											
7 Church											
8 Post office /telephone											
9 Creche											
10 Police station											
11 Court/ Administration											
12 Water source											
13 Firewood source											

\* 1 if inside the village and 2 if outside the village.

**3.7 Impact of improved transport facilities:**

**3.7.1 Would you like to travel further than you can at present?:**

- 1     Yes
- 2     No

**3.7.2 Would the ability to travel further help you?**

- 1     Yes
- 2     No

**3.7.2.1 If yes, in what way?**

- 1     By taking my product/services to bigger markets
- 2     By commuting to work
- 3     By undergoing further education

**3.7.3 Given the opportunity, would you like to leave this place permanently?**

- 1     Yes
- 2     No

**3.7.3.1 If yes, why?**

- 1     Lack of opportunities in the area
- 2     Lack of accessibility to opportunities

**3.8 Any other comments you would like to make, which has not been covered in the questionnaire:**

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*Thank you very much for your kind cooperation*

