# ADDRESSING KNOWLEDGE AND METHODOLOGICAL GAPS IN TRANSPORT PLANNING FOR VULNERABLE RURAL TRANSPORT USERS: A CASE STUDY OF SELECTED VILLAGES IN LIMPOPO PROVINCE

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## ABSTRACT

The paper reports on an empirical travel survey, undertaken in a deep rural area of South Africa, to illustrate how improved understanding of rural travel behaviour can enhance transport planning. A custom made instrument incorporating both quantitative and qualitative research methods adopted in the survey, generated spatial-temporal travel data covering weekdays and weekends, for vulnerable travel groups that included the elderly, disabled and young children. The investigation confirms the knowledge and methodological gaps that exist and need to be addressed for rural transport planning in South Africa.

## INTRODUCTION AND BACKGROUND

Transport research, policy and planning have until recently, assigned little attention to understanding the travel behaviour of vulnerable transport users in deep rural areas. Given that children, the disabled and the elderly constitute a significant population of the rural areas of many developing countries, including South Africa, this is a surprising oversight.

Only a few previous studies investigating travel behaviour of vulnerable transport users in South Africa exists resulting in the general lack of rigorous and systematic research as well as limiting the potential influence of research on policy and strategy development and intervention (Mashiri & Pienaar, 1994; Mashiri & Sarkar, 1998; Porter et al, 2010a; Porter et al. 2010b; Mashiri et al, 2012). Furthermore, the current framework used for household travel survey in South Africa is fraught with assumptions that limit improved understanding of rural transport users, especially the vulnerable users. Often these travel surveys categorise mobility patterns that are different from conventional urban patterns as the category “other”. Limited understanding of these travel market segments entrench social exclusion in that these household travel surveys are used for the design of welfare programmes such as public transport subsidies, and without an understanding of these travel groups, such welfare programmes become ineffective. Ultimately the provision of transport services for these market segments is often left to the discretion of profit seeking private operators.

Improved understanding of travel behaviour of vulnerable rural transport users is critical in enhancing transport planning, particularly in the design of transport services. This is especially true amongst the disabled, children and the elderly in rural areas, for whom geographical isolation, long distances, poverty levels, poor infrastructure and limited transport services inhibit access to services and resources (Vasconcellos, 1997).

Trip generation, at a person level, can be explained as the number of trips undertaken by an individual in a given period. It is a characteristic measure that can be used to forecast the number of trips that an individual makes, and in turn to size the capacity requirements of the transport system required to serve the trips. In urban areas it has been shown that once measured, trip generation rates are fairly stable until the personal circumstances

change fundamentally. In rural areas such a claim cannot necessarily be made, especially for vulnerable transport users. It has also been established that in the urban areas, travel patterns remain fairly stable, especially for commuter trips, which allow for development of transport models that can be used for long term forecasts. Such a claim cannot necessarily be made for rural areas, especially for vulnerable transport users. Without lack of confidence in these fundamental planning tools, it becomes difficult to plan transport properly.

In order to understand mobility patterns, without any form of assumptions, it is necessary to observe mobility as it takes place. For this travel diaries and activity diaries have often been used. However, vulnerable rural travellers are often unable to read or write, and even if they are able to do so, they are sometimes unable to read or interpret tables that are required for these measurement tools. Trip recalls surveys are also difficult to administer in the rural areas because of the general lack of time keeping. Ultimately what is required in these settings is a tool that is responsive to the actual travel patterns and is not too reliant on the respondent's response capacity.

In terms of disabled and elderly populations, the majority of available focused research on travel behaviour and trip generation rates is concentrated in the developed countries, often focusing on trip making characteristics for example, Schmocker et al (2005) examines the disability effects on the pattern of trip generation among elderly and disabled people. Stern (1993) has studied the transportation choices of the elderly and disabled in rural Virginia. The studies mentioned above show the urgency of achieving a better understanding of travel behaviour of vulnerable people in rural areas.

While knowledge and methodological gaps exists pertaining to the travel needs and patterns of vulnerable transport users in deep rural areas, there is clearly considerable scope for further, and more in-depth, research. Certain methodological considerations pertaining to broadening and strengthening research in this regard have been raised recently in some studies that profile the travel needs and patterns of vulnerable rural transport users.

Understanding the travel behaviour of vulnerable rural transport users presents some methodological challenges. In order to understand mobility patterns, without any form of assumptions, it is necessary to observe mobility as it takes place. For this travel diaries and activity diaries have often be used. However, vulnerable rural travellers are often unable to read or write, and even if they are able to do so, they are sometimes unable to read or interpret tables that are required for these measurement tools. Trip recalls surveys are also difficult to administer in the rural areas because of the general lack of time keeping. Ultimately what is required in these settings is a tool that is responsive to the actual travel patterns and is not too reliant on the respondent's response capacity.

Recently there have been efforts to develop and implement advanced methodologies to profile travel needs and patterns of vulnerable transport users in deep rural areas. For example Maritz (2008) studied the use of Global Positioning System (GPS) data loggers to capture individual travel data with the aim of understanding individual accessibility in a rural context. In this case the individual is the unit of analysis. Maritz (2008) argues that for a long period in South Africa, cumulative accessibility measures have predominantly been applied in understanding travel needs and patterns resulting in accurate assumptions. Maritz (2008) highlights the idea that human beings are engaged in distinct activities and each individual manages time differently to accomplish their own daily activities.
Studies investigating travel patterns of rural areas indicate that particular conditions present in rural areas (especially poor ones) raise specific challenges to the application of travel demand modelling techniques developed and applied in urban settings. For example the

use of the travel diary in South Africa's rural areas is increasingly being viewed by many researchers as difficult to administer due to low levels of literacy (Maritz, 2009; Venter & Venkatesh, 2009).

## PROJECT SITE

The selection criteria of the study area included typical rural areas that are isolated, remote and dispersed. The rural villages that were selected had to have some households with known disabled persons, children under the age of 15 years old and the elderly persons of the ages of 70 years and above. The study villages are located in the Makhudutamaga Local Municipality in the Sekhukhune District one of the five districts Municipality's in the Limpopo Province. The study villages are Ga-Marishane, Phokoane, Kutupu and Vlaakplaas, all under the Makhudutamaga Local Municipality. According to the Makhudutamaga Integrated Development Plan (2011) the municipality is completely rural, dominated by traditional land ownership. The municipality covers an area of approximately 2096 square km, and is made up of 146 settlements, with a population of 300 206 people and 56 642 households, which amounts to more than 24% of the Sekhukhune District. The municipality is characterised by a weak economic base, poor infrastructure, major service delivery backlogs, dispersed human settlements and high poverty rates (Makhudutamaga Local Municipality Integrated Development Plan, 2011).

## METHODOLOGY

The methodology that was used in the study consisted of two phases. The first phases involved preparation. This was achieved by firstly seeking permission from the Makhudutamaga Local Authority to conduct the data gathering exercise. A group of community development workers were assigned by the municipality to assist the CSIR in identifying disabled, elderly and children as participants in deep rural areas. The preparatory phase also involved informing participants of their confidentiality rights and obtaining their permission for using the information. The aims and objectives of the project were disclosed to the participants.

The second phase involved the issuing of the GPS data loggers. Each participant was handed a single GPS device. The device was activated to start recording at 6:00 am the following day. They were instructed to carry the device with them for the duration of the entire day. The device would record the movement of the participants until it was returned the following day. On the day the devices were returned, an interview was undertaken with the participant to ascertain the nature of activities that they were engaged on that particular day of the GPS recording. The interview would therefore supplement the GPS data. For the purposes of this study the interview recorded information like time, mode of travel, frequencies of such travel and type of activity. This information would be supplemented by the GPS information to create a complete profile of the person's travel patterns.

## DISCUSSION

### Survey Design

The experiment was designed to capture person level data on the following parameters:

**Individual parameters**: income, vulnerability (disabled, elderly, children), vehicle ownership

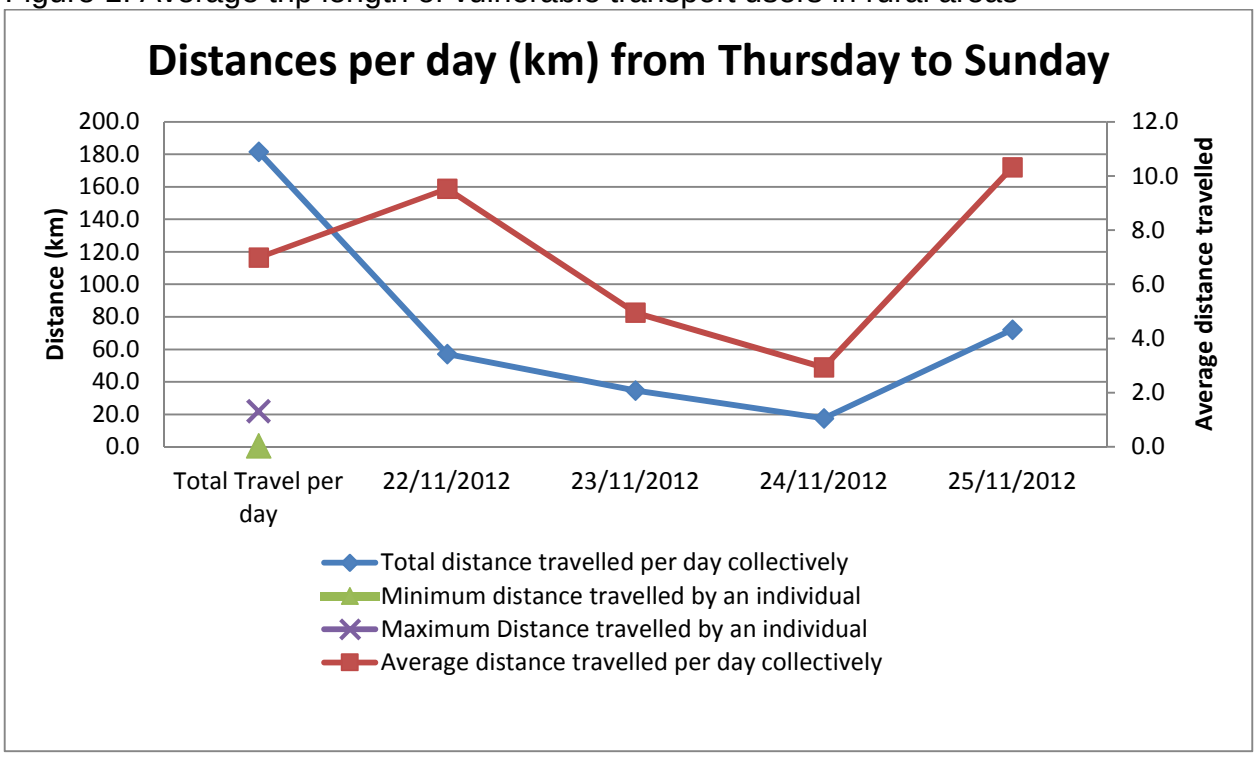
**Trip parameters**: number, duration, length (distance), purpose, mode

## DESCRIPTIVE ANALYSIS OF TRAVEL BEHAVIOUR

This section reports on the findings made in respect of the surveys that were carried out as part of the study. The surveys were undertaken in order to answer the following key research questions:

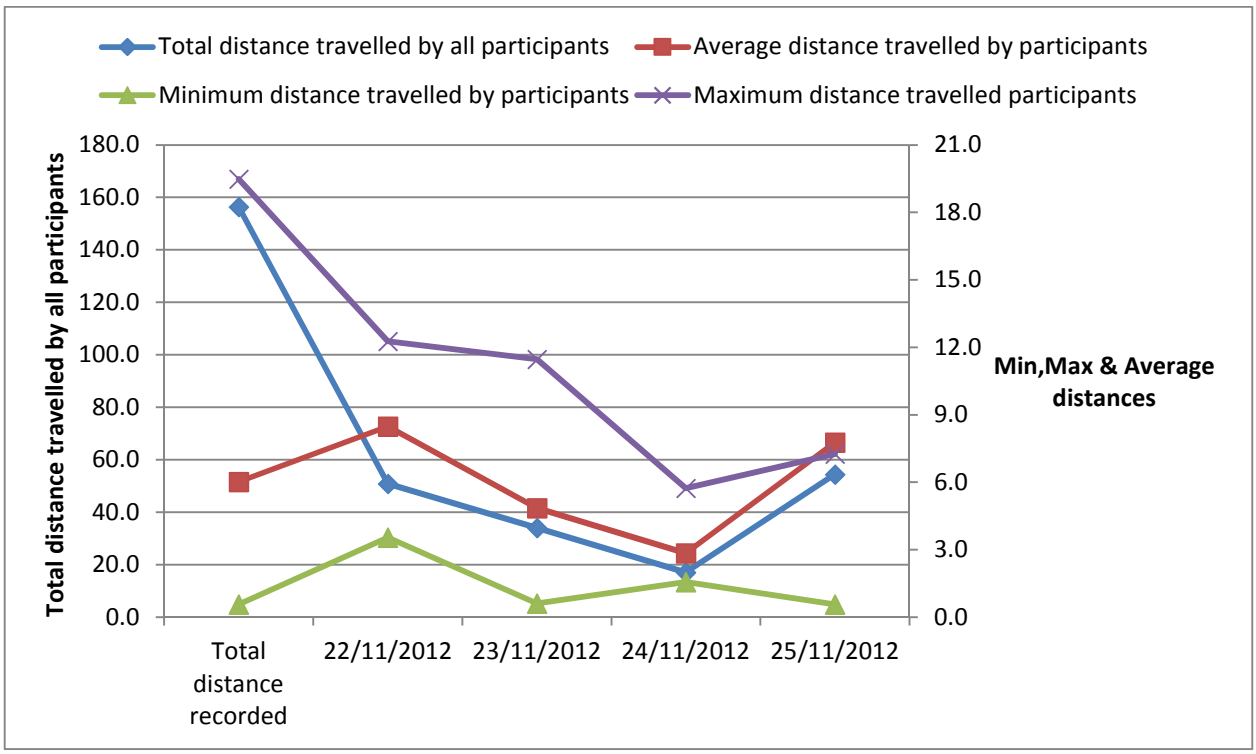
- How do vulnerable transport users in deep rural areas travel?
- For what purpose do vulnerable transport users in deep rural areas travel?
- How often do vulnerable transport users in deep rural areas travel?
- What is the extent of suppressed travel demand for vulnerable transport users in deep rural areas?
- What tools are appropriate for collecting travel data for vulnerable transport users in deep rural areas?
- How should trip generation rates of vulnerable transport users in deep rural areas be estimated?
- What are the trip generation rates of vulnerable transport users in deep rural areas of South Africa?

Figure 1: Average trip length of vulnerable transport users in rural areas



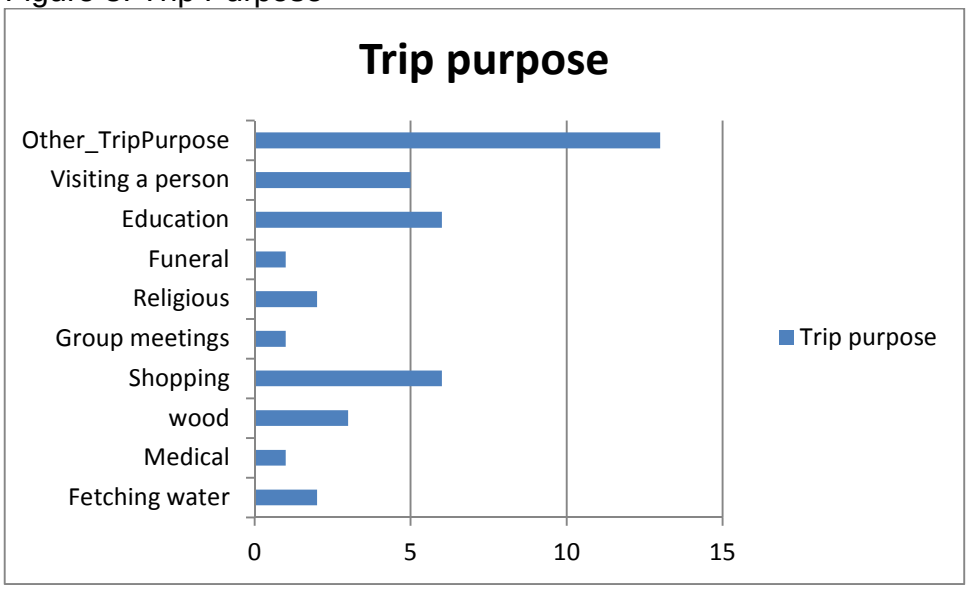

The above graph depicts travel distance of the sampled participants in rural villages of the Makhudutamaga Local Municipality. The total distance that was covered over the 4 day survey period is 181.7 km for all the participants who volunteered to take part in the survey. The average distance amounted to 7 km per trip. The maximum distance that was covered by an individual on a single day was 22.1 km and the least amount of distance travelled was 569 metres. From the sampled participants the data supports the conclusion that generally, people from the rural areas, particularly vulnerable sections of the population undertake fewer trips. On individual days from Thursday, a distance of about 57.1 km was recorded for 6 persons who participated on that day. A decline is also noted towards weekend with trip distance reducing to about 34.7 km and on Saturday lowering to about 17.6 km. An increase in distance covered is noted on a Sunday. The recorded distance was 72.2 km at an average of 10.3km.

Figure 2: Walking distance travelled by vulnerable transport users




Walking was considered as the only convenient mode of travel to accomplish many of the daily activities. 26 people from the sample reported walking as their mode of travel. In total a distance of 156.3 km was travelled by walking from 22nd November to 25th November 2012. The average distance travelled was 6km. An observation that also emerged is that of a decline in trips by the participants on 23 and 24 November 2012 whereas on the 22 and 25 there is sharp increase in travelling. It would be of interest to investigate further the type of activities that the sample individuals where engaged on the days that there was increase in travelling. It is also important to consider that travel patterns in rural areas do not remain the same for long. One reason the latter was experienced is that participants on Friday consisted mostly of the disabled participants and did not travel far as the other groups.

Figure 3: Trip Purpose

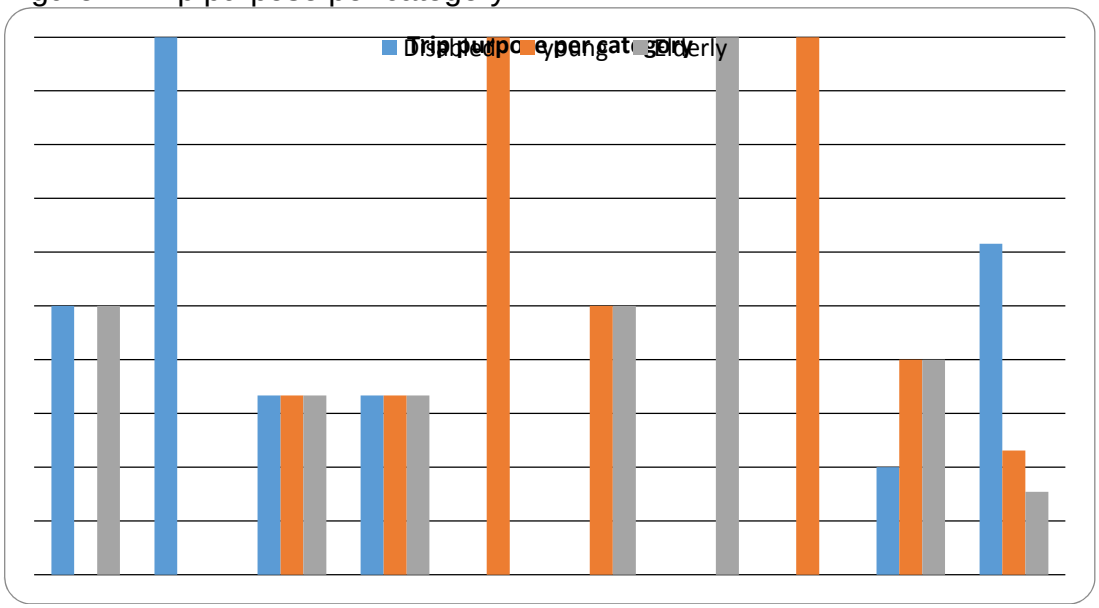



The graph above demonstrates the issue of data collection being insufficient to explain the trip purpose, but does give some indication that the questionnaire did not cover non making

trips. The “other Trip purpose” represents non trip making which are domestic related activities and the other trips that are made like “visiting a person” or “education trips” represent trips were undertaken outside of a yard. With the limitation of numbers of participants no conclusive generalisation can be established from this numbers. This gives an indication of trips that can be made by the vulnerable transport users within rural areas. Out of the survey, what can be gathered is that shopping and education trips are at a tie of 6 round trips per person. The methodology did account for trip chaining but there was none present in the data. Trips are then decided to be round trips based on the latter issue. Characteristics of trip making in rural areas are of necessity based and if not necessary then one would not embark on. One difference is with school children, they may make trips that entertain them and not necessarily important to make. The NHTS provides with aggregate household information while the survey conducted shows individual travel and claims that to better understand travel one should consider looking at the individual travel patterns.

Reasons for not travelling ranges from “not having money to travel” to weather hindrances experienced. The money was a problem for 2 participants, being tired was also a factor for another 2, babysitting and “not transport related” factor was another cause and for the rest no reason was given for not travelling and when one did travel, none was required. No need to travel was also a factor for some participants. For the second and third problems which are none transport related, no solution needs to be sort. For money issue, there is a need to establish if that was a basic hindrance or just for that particular individual. In conclusion to the none travel reason, it can be noted from the survey that every participants if given more time to have an opportunity to travel, will issue a unique reason why they did not travel, as for the ones that are there the reasons are as said.

Figure 4: Trip purpose per category




For trip purpose per category, i.e. the elderly, young and disabled persons, there are activities or trip purposes that one group may entertain as compared to the other. The disabled attended to medical, while the young and elderly attended to group gatherings, education and Funeral, respectively. What might be outstanding is looking at the fetching of wood and shopping as being at par across different groups of the vulnerable rural transport users. Less travel activities are taken by persons with disabilities and including the elderly.

## CONCLUSIONS AND RECOMMENDATIONS

In conclusion, since travel was not incited, further research needs to be explored for periods longer than a day per individual participant. This comes as a result of ascertaining trip making in terms of number of days per week or a certain week in a month (e.g. End of month travel).The adaptation of a new methodology for trip generation in rural areas for vulnerable transport users has been demonstrated by adding information related to trip purpose. Trip purpose includes for example fetching water, fetching wood, visiting the cemetery, and so on. The questionnaire was set up to acknowledge the environment in which participants dwell and also for participants to relate to the questions that are being posed. The questionnaire success was based on those two requirement but they are not exhaustive of the questionnaire design. With regard to the research instrument a paper based interview was conducted in order to make the survey seem less threatening to the participants. The GPS was utilised to record distances travelled by individuals and to then map the trip.

Trip patterns are mapped out to be radial from the origin, which is home, to other trip attracting places like school, shopping centres, workplaces, rivers and some to the bush for picking wild fruits. Walking was the most prominent mode of transport and considered to be a primary travel mode for all trips.

The study concludes that although trip making by vulnerable users are not high in deep rural areas, an important finding was that this trip making is closely associated with necessity. Vulnerable users therefore only travel if the trip is necessary and important. Factors affecting trip making include for example fear of crime. School children especially cited this factor as something that limits their travel behaviour and within these communities older children (boys) are paid to accompany girls and younger children on further journeys. The study discovered that although trip making is not that high but trips made were deemed as required trips to participants. Some trips could not be made because of fear from being a crime victim and that affected the school going children who had to travel long distances. Payment has to be made for children to be escorted by older boys to far places on a daily basis.

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