

別紙様式 5 (Attached Form 5)

学位論文要旨 Abstract of Thesis

所属専攻 Field: Transportation Planning 専攻(Field)

氏 名 Name: RAHMAT Mohibullah (ラフマット モヒブラー)

Title of Thesis

Demand and Driver Supply Implications of a Regular Bus System for
Kandahar City, Afghanistan

路線バスシステム導入のための利用需要の予測とバスドライバーの供給に関する研究
—アフガニスタンカンダハル市を対象にした需給均衡分析—

Abstract

With the increase in population and development of societies, the demand for transport also increases. This generates some serious challenges for transportation providers because they must respond to the growing demand by providing convenient means of transport while simultaneously maintaining the economy, safety, environment, and other demands of societies. However, one of the most essential and critical issues is the sustainability of these developments, particularly, in the field of transportation engineering. In most of the developing countries, public transportation services are initially dependent on paratransit systems. Though, with development of cities and increase in population and demand of public transport; paratransit systems may fail to provide sufficient services. Therefore, almost always paratransit systems are partially or completely replaced by regular and mass transit.

Kandahar city of Afghanistan being one of the largest cities of the country does not have any regular system of public transportation. The paratransit system is the only mode of public transport available in Kandahar city and operates as an irregular and informal transport sector. The paratransit system of Kandahar city has number of deficiencies in terms of level of service. The most crucial being the irregular services provided by the system. In general the operations and fleets of the paratransit system is not controlled or regulated by the government and/or other agencies. As a result, the drivers operate where ever they think can find customers. Particularly, the taxis which operate on fixed routes and are the most used modes in the paratransit sector provide their services only on the major

routes which generate huge gaps in their accessibility. Even some of the most essential routes leading to universities and schools are not served by the current public modes which left no choices for the students rather than using the private vehicles.

Unfortunately, at the moment the entire picture of the current services and future plans is unclear due to the lack of travel behavioral data including trip rate, travel time distribution, modal share and so on. More serious is that mechanism behind the behavior has not been figured out, so that no comprehensive transportation planning was established from theoretical basis. As the unprecedented study in Kandahar city, this study is focusing on two aspects of paratransit system of Kandahar city. The first aspect is called the “Demand Side” which deals with the need and usage of current paratransit system, its deficiencies, level of services, the transportation needs of women and other relevant issues and the “Supply Side” which is focused on the drivers of paratransit system in Kandahar city of Afghanistan. The objective of the Supply is to check willingness of the paratransit drivers in becoming bus drivers in the future, identify the factors that will affect their willingness and determine the maximum number of drivers who will shift their jobs.

For collection of the data, two questionnaires were designed. The first questionnaire was designed to collect the data about demand of the public transport and to identify the factors which may affect the mode choice behaviors of respondents. The core objective of this questionnaire was to collect data regarding socio-demographics, Revealed Preferences (RP) for identifying daily trip patterns (trip dairies) and Stated Preferences (SP) for future mode choices. The SP survey was designed in accordance to Fractional Factorial Design. Four options of transportation modes such as private car, private motorcycle and taxi (currently available modes) and bus (future plan), were selected to prepare SP choice sets. For studying the demand side (i.e. drivers) of paratransit system a second questionnaire was developed. Using face-to-face interview techniques, this questionnaire asked the drivers about their socio-demographics and questions related to their vehicles and jobs. Bothe surveys were conducted in September and October of 2016 and five professional interviewers were hired and trained to complete the survey. A total of 603 eligible responses were obtained for the first questionnaire and 200 for the second.

The results demonstrated that the overall ridership of paratransit sector is very low for daily trips because of the irregularity and limited coverage of the paratransit system and the dominance of private vehicles. The multinomial logit model results suggest that Kandahar city residents are more sensitive to the travel time for a public transport mode compared to its travel cost. In other words, speed, waiting time, number of stops and stations, and the distance between the stops play a vital role in terms of ridership. Other socio-demographic factors such as gender, age, monthly income, and vehicle ownership are also demand

determinant factors. Particularly, consideration of women in all processes of planning and operating public transit is very essential. Further analyses show distinct and clear disparities in socio-demographic characteristics of men and women of Kandahar city leading to trip disparities. Almost all of women do not own any types of personal vehicles, they are less educated and do not have jobs. Likewise, there is a huge gap between trip characteristics and patterns of men and women. Majority of female trips are for educational purposes while male trips are more dispersed over multiple activities. Motorcycle is the most dominant and preferred mode for men, while women are mostly walking or using available public transit. Compared to men, women were recorded to have lesser trips per day over short distances. Transportation choices of women are also limited to walking, accompanying other male members of family or using public modes. However, men are generally using their private cars, motorcycles and bicycles together with all those options available for women.

On the other hand, due to low income, higher working loads and some other job related factors, the drivers of paratransit system are not satisfied from their current jobs and have shown strong willingness to become bus drivers in future. Our findings showed that 61% of paratransit drivers are willing to change their jobs and 50.5% are eager to join the bus system. Further analyses demonstrated that age, education, vehicle type, daily working hours, daily mileage, job income and availability of other income sources will significantly affect the willingness of drivers to change their jobs. Furthermore, the willingness to become bus drivers is affected by age, education, daily working hours, job income and availability of other income sources. To be more precise we can state that younger and educated drivers have higher willingness to become bus drivers. Similarly, rickshaw drivers who have less income compared to other drivers are also willing to join the bus system. Similarly, one of our main objectives of the study was to calculate the maximum number of buses for the proposed bus system in Kandahar city as well as to check if the supply of the drivers could be achieved from the paratransit drivers who are willing to join the bus system in the future. Our results showed that in order to operate the bus system in Kandahar city we will need an initial amount of 31 buses. These buses will have a total capacity of 9,996 persons per day. Looking to the current trend and usage of public modes in Kandahar city, we believe that if the bus system can attract this demand it will be a positive sign for enhancing the public transportation in the city. On the other hand, analysis of the supply side (drivers) and its correlation with the demand side showed that the probability of the drivers who will shift their jobs is high and if the government and policy makers approve to allocate a minimum monthly salary of 6,000AFN; we can hire all drivers required to operate the bus system from the current paratransit drivers.