Abstract

Millions of suburban commuters depend upon the services of the Indian suburban railways for their journey to work. The commuters use different access modes of travel to arrive at the suburban railway stations. Most of the suburban railway stations are not planned adequately to accommodate the access modes. As a result disorder prevails in the approach to the stations.

All the suburban railway stations (SRS) are not equally busy and their facility requirements are not equal. The modal split of the access modes to the SRS determine the facilities required at the station area. Hence the estimation of modal split is essential for judicious fund allocation and facility provision for the SRS.

So far no study is available on the access mode choice behaviour of the Indian suburban railway commuters, neither there is any methodology for assessing the modal split of the commuters. This research, therefore, aims to develop a methodology to assess the access mode choice behaviour of Indian suburban railway commuters to the station, and hence, predict the modal split of the access modes at the SRS.

The study is based on surveys and analyses of the data obtained from the commuters in the 129 km long suburban rail route between Howrah railway station and Medinipur railway station operated by the South Eastern Railway in West Bengal, India.

There are hundreds of suburban railway stations in India, and it is difficult to have access mode choice rule for each station. In the present research, stations having similar catchment area characteristics are clustered to form groups that are homogeneous in content, and then cluster-specific individual access mode choice rules are developed for each cluster of stations. The cluster-based individual rules estimate modal splits more realistically rather than using a general rule taking all

SRS into consideration. The K-Means algorithm is used to cluster the suburban railway stations, the Multinomial Conditional Logit model is used to develop the individual access mode choice rules for the commuting suburbanites, and the Sample Enumeration Method of aggregation is used to obtain the modal split.

On the basis of the characteristics of the catchment areas, the suburban stations between Howrah RS and Medinipur RS are classified into three distinct groups: the busy, the moderately busy and the less active SRS. An effort to divide them into four groups resulted in an empty upper cluster. For the busy and the moderately busy stations the behavioural models are best estimated by including socio-economic characteristics of the commuters as well as the vehicular attributes as independent variables. The model for the less active SRS is found to predict best if only vehicular attributes are chosen as independent variables. For the busy and the moderately busy stations, the aggregate predictions differ from the observed modal split by less than ± 5%, whereas for the less active stations the variations are less than ± 6.5%.

When a suburban railway station shifts from one cluster to another, the access mode choice rule for that station changes accordingly. To review the existing cluster positions, the clustering algorithm must be applied at regular intervals with updated input data. It is proposed to use the data available from secondary sources for savings in terms of time and money.

An effort to develop a single behavioural rule for all stations has proved inadequate, whereas, the cluster-specific behavioural rules are found to efficiently assess the shift in modal split resulting from changes in policy actions.

It is recommended that the Indian Railway and the concerned municipalities apply the findings of this research for optimal facility planning at the suburban railway station areas.