

ABSTRACT

In Calcutta recently there have been strong pressures from certain groups of the society for the removal of the tramways from Calcutta streets to give way to automobiles. In spite of the various attempts to force the tram cars off the Calcutta streets, the century-old transportation system survived due to several merits of its own.

This necessitates an evaluation of the tramways in comparison to alternative public transit modes, based on the criteria that lead to the choice of modes, and the factors governing operation of the systems. Hence, this research.

This research aims at evolving a decision-making model to critically evaluate the tramway system, and in particular it aims at answering -- *'SHOULD THE TRAMWAYS IN CALCUTTA BE CONSERVED ?'* -- If the answer is 'Yes', then *'WHAT IMPROVEMENTS IN THE SYSTEM ARE NECESSARY FOR WIDER ACCEPTABILITY ?'*

On-street public transit modes operating in Calcutta are trams, buses of State Transport Corporation (CSTC), buses of South Bengal State Transport Corporation (SBSTC), private (ordinary) buses and mini buses. There are about 29 tram routes operated by The Calcutta Tramways Company (1978) Ltd. (CTC), 37 special bus and 58 ordinary bus routes operated by The Calcutta State Transport Corporation (CSTC), 143 ordinary bus routes, and 100 mini bus routes operated by private agencies serving about 7.5 million passengers per day.

The overall picture of the physical and economic performance of the tramway company in Calcutta reveals that the State Government which is operating the system is unable to maintain the system economically. As a result, there is a great pressure to do away with the system.

The survey of the mode users, expert groups, and the operators reflect that people in general are against the withdrawal of the tramway system, and they prefer the system's expansion within the city and along the outskirts of the city.

Till today several methods have been developed for evaluating alternative systems and project decisions. The fields of application of these methodologies vary widely from purely economic to environmental, to socio-psychological.

Concordance analysis has been found to be one of the most appropriate multi-criteria methods where both qualitative and quantitative factors are simultaneously considered for evaluation. Therefore, this technique with suitable modifications can also be applied to transit systems evaluation. Such a modification can help the decision-maker in determining the level of improvement required for individual transport systems.

Evaluation of the tramway system in Calcutta with respect to other public transport modes is the major concern in this research. A methodology has been devised for assessing the overall levels of utility of the tramway system vis-à-vis other public transport modes operating under similar transit corridor environment.

The model that has been developed assesses the overall utility of a transport mode vis-à-vis other modes of travel. The modal characteristics of any public transport mode set limits to its utility, while the effective utility of the transport mode depends on the demand for the level and quality of services the mode is capable of rendering. This demand is a result of decisions based on several criteria. Therefore, if utility has to be the basis for modal comparison the methodology should reflect the interaction of the modal characteristics with preferences for such characteristics.

Stability for the criteria weights for preference and non-preference have been analyzed through the proposed methodology to assess the stability of individual criteria weights. Sensitivity of the mode characteristics for preference and non-preference have been analyzed to identify the changes required for improvement of tramway system.

The selection of a set of criteria for the evaluation of the tramway system in Calcutta. Cost, Comfort, Safety, Speed, Reliability and Convenience are commonly used criteria in transport mode evaluation. Other than these historic image, employment opportunity, and aesthetics have been considered for evaluation of modes.

In this research, an attempt has been made to identify only those interest groups which are directly or actively involved with public transit systems in Calcutta.

An interactive software (**MULTICEM**) has been developed for application of the model. The model has been applied independently for individual interest groups (who have their independent weights to criteria), and the ranking result has been analyzed.

Among the public transit modes operating on the streets of Calcutta, tram has been found to be the most comfortable, safe and environmentally neutral mode. It has low operating speed in the streets of Calcutta. Its tracks are laid on road forcing it to operate

on the same space with other modes. Its reliability is low due to reduced frequency, over-aged fleets subjected to frequent breakdowns, resulting in uncertainty in reaching destination in time.

In this research tram has been compared with other on-street transit modes in terms of **Productivity, Flexibility, Economic Characteristics, Comfort Levels and Environmental Impact**. Environmental impacts of transit modes have been studied under two broad headings, viz. **Air Pollution and Noise Pollution**.

From the point of view of productivity, ordinary bus supersedes tram, though theoretically this should be the reverse, which is due to low maneuverability of tramway system. Trams have been found to be the most comfortable mode operating in the streets of Calcutta in terms of spatial and interior environmental considerations. Contrary to the present trend, if buses are replaced by trams, there would be a considerable reduction in the pollution level in the city streets.

Conclusions of the study and analyses as above answer the final question *"SHOULD THE TRAMWAYS IN CALCUTTA BE CONSERVED ?"* in affirmation. Further, as a reply to *"WHAT IMPROVEMENTS IN THE SYSTEM ARE NECESSARY FOR WIDER ACCEPTABILITY ?"*, the direction for improvement of the system has been found primarily in terms of its reliability criteria (viz. frequency, speed and reaching destination in time). This can be accomplished by reinstating, wherever possible, the reserved right-of-way along with suitable technical improvements of the tramways.

Light Rail Transit, operable mostly on the reserved right-of-way, is regarded as a reasonable solution for the newer parts of Calcutta. This will effectively cater to rising passenger trip demands while meeting the requirements of energy and environment.

The methodology developed in this study along with the areas recommended for further research would go a long way in deciding appropriate transit policies for larger urban areas.