ABSTRACT

In the field of Transportation Systems Analysis a diversity of models exist today, generally making use of the entity referred to as the 'zone'. This research attempts to come to terms with three types of zonal modelling problems, by proposing an alternative methodology. These problems relate to high data collection costs, intrazonal variables being of the same order as interzonal ones, and to the two dimensional discrete nature of zonal models which is not as amenable to mathematical analysis as a one dimensional continuous approach may be.

Travel demand functions are first investigated in a hypothetical 'linear system'. Alternative modelling approaches are presented. Various travel impedance measures and impedance functions are investigated, leading to the formulation of the Opportunities Impedance and the Generation Impedance models as special cases of a more general gravity modelling approach. The technique is further developed for more complex systems, and eventually to the general 'network system'. Various concepts are discussed, such as route choice by route accessibility index, the general idea of travel energy of which mean trip length is a special case, 'local route assignment' which transforms a two dimensional system into a collection of continuous and connected linear systems, and travel response to system changes prior to arriving at steady state conditions.

In order to test the concepts presented data were collected for 1973 and 1978 for the study area, the Trinidad and Tobago Capital Region. Trip generation and modal split models were calibrated for 1978. Flow models were calibrated for both 1973 and 1978. For these calibrations, conclusions are arrived at concerning the relationships between model constant , travel energy (including mean trip length), calibrating ststistic used and the level of aggregation

of input data. Considering the problems of data availability that were encountered, model calibrations are considered satisfactory.

Finally, the Linear Systems Theory is evaluated in terms of predictive ability. Using 1973 models, 1978 travel was simulated and compared to 1978 data collected in the traffic survey. Model predictions are considered encouraging and suggest the desirability of further testing. Using 1978 models, the application of the technique to simulating travel demand and transportation system characteristics as changes are made to the 1978 system is illustrated. Using intuitive judgements, generation, modal split and flow models are shown to reasonably responsive to system changes. The research report concludes with a presentation of conclusions arrived at concerning the transportation system and tripmaker characteristics in Northern Trinidad and the potential usefulness of the Linear Systems Theory. Recommendations for future research are presented.