

**DATA AND MODELS FOR UNDERSTANDING  
AND MONITORING TRAVEL BEHAVIOUR**

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**ABSTRACT**

Increasing traffic congestion and deteriorating environmental quality in our urban areas resulting from increasingly car dependent travel behaviour, is forcing governments to look for policies to encourage public transport use. Effective policy making to bring about a reform in the neglected public transport sector and to influence a shift in travel behaviour, requires data to understand and predict travel behaviour patterns and to monitor changes in behaviour resulting from policy initiatives particularly in relation to service provision and infrastructure development.

The Transport Data Centre (TDC) at the NSW Department of Transport (formerly the Department of Transport Study Group), has in the past collected personal travel data at 10 yearly intervals (1971, 1981 and 1991) and maintained a traditional four step travel demand model which was designed primarily to forecast travel demand on the road system in the morning peak period. This approach is no longer suitable for the policy decisions and the demands of integrated transport and land use planning which are required today.

A review has been undertaken of the data collection and modelling strategies of the TDC and recommendations for a new approach have been accepted. This paper discusses the new directions for data collection and modelling being pursued by the TDC, and their relevance as input to policy making and transport service and infrastructure planning.

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## 1. INTRODUCTION

Transport planning and policy decision making requires a delicate balance of political judgement, appreciation and assessment of broad social goals and needs, and input of appropriate data and technical expertise in the analysis of that data. Throughout modern urban and transport planning history the importance of each of these elements has waxed and waned according to the prevailing political climate and research paradigms of the day.

This paper discusses the role that data and modelling analysis have played in the development of transport planning in Sydney in the post war period with particular emphasis on the future directions being pursued within Government in New South Wales.

## 2. URBAN PLANNING 1945 TO 1971

As in most western cities, the basic tool of urban management in Sydney in the post war period has been the metropolitan plan. The first of these for the Sydney metropolitan area was the "County of Cumberland Planning Scheme", 1951. This planning document largely followed the UK model of extensive greenbelt zones surrounding the central metropolitan area with designated decentralised town or suburban developments beyond that zone. Pressure of population growth in the economic boom years following the war encroached on the greenbelt area making it no longer relevant, or its goals feasible, by the early 1960s.

Considerable analysis of Sydney's development needs was undertaken throughout the 1960s culminating in the publication by the State Planning Authority of the "Sydney Region Growth and Change - Prelude to a Plan" in 1967. This was followed by Sydney's next major planning blueprint "Sydney Region Outline Plan 1970-2000 AD", published in March 1968. As the name implies it was intended that this Plan would provide the direction required for the development of Sydney to the turn of the century.

The data underlying this Plan were primarily population projections along with associated employment and workforce projections. The strategy proposed in the Plan was for development to be undertaken along major transport corridors, that is along railway lines, and for decentralisation of employment opportunities so as to contain the travel time for the journey to work and to reduce increasing congestion on roads to centrally concentrated employment locations.

At the time this Plan was released, it was reported that it was not possible to finalise the detailed transportation studies associated with the development proposals. This was mainly because the Journey to Work data from the 1966 Census were not available at the time of publication. It was also reported that "the formulation of comprehensive proposals for the building of a regional transport network is a difficult task requiring extensive surveys of the movement of people and goods together with measurement of the capacity of the different transport modes available to deal with the total traffic demand" (Sydney Region Outline Plan 1970-2000 AD, 1968, p.36).

These tasks were to become the subject of a separate enquiry. The first major transportation study of Sydney, the "Sydney Area Transportation Study" (SATS) was published in 1974. The three

most critical problems identified in this study were:

- peak hour journey to work movements focussed on the Sydney CBD
- peak weekend and holiday movements to the beaches and resort areas
- movement of goods in relation to the port and to bulk rail and road terminals

The objective of the Study was to identify infrastructure needs to accommodate predicted travel demand. As part of the Study the first major Sydney Household Interview Survey was conducted which collected details of travel by a random sample of households in the Sydney Metropolitan area. Although a survey of freight travel was not actually conducted, studies were undertaken of the movement of major commodity groups through the metropolitan area, in particular to/from the ports and other major freight terminals.

This Study was also responsible for the development of Sydney's first travel demand model which has become known as the Strategic Travel Model (STM). In line with the state of the art in travel demand modelling of the day, this model was built in the traditional four step structure of trip generation, trip distribution, modal split and assignment. The model was used primarily to predict the number of trips on the highway network for the base year, and then driven by forecasted estimates of population, employment and workforce, to determine the number of trips for designated forecast years. The main conclusion arising from the Study was that a massive program of road building was required throughout the Sydney area to accommodate the predicted increase in private vehicle traffic.

The main data inputs to the Study were related to actual volumes of traffic from the 1971 Home Interview Survey and the Journey to Work data from the 1966 Census, in conjunction with data on the physical capacity of the road network. Transport planning at that time was very much the domain of highly technocratic professionals, particularly engineers responsible for infrastructure provision. Its focus, and thus its input requirements, were primarily of a physical nature akin to engineering concepts, that is, volume of traffic or mass in relation to capacity. The four step travel demand model with which we are all familiar, works on the gravity principle of attraction and distribution of trips between zones according to the physical characteristics of the networks. Trips are generated based on zonal averages of population and the number of persons in the workforce.

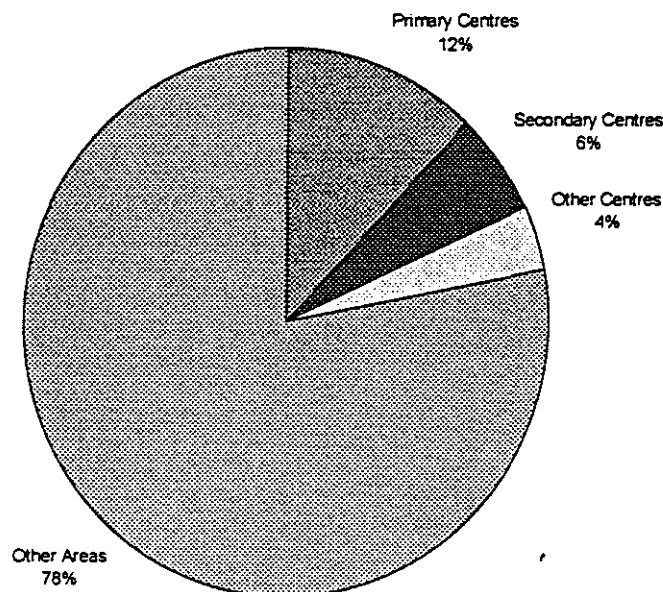
These plans, formulated in the 1960s and early 1970s, but designed with the intention of serving Sydney through to the turn of the century, were based on a limited set of static data concepts of population numbers and traffic flows. The demand for development, and the plans set out to accommodate that development, were driven by projections of this limited set of data inputs. The inherent structure of the travel demand model meant that it predicted future travel demand based on a continuation of current trends.

One of the goals of the "Sydney Region Outline Plan 1970-2000 AD" was to achieve a dispersal of employment opportunities to relieve the congestion pressures on the central Sydney CBD and to reduce the ever increasing length of travel time for the journey to work. However this dispersal of employment occurred in areas which were not easily accessible by public transport which remained centrally focussed on the Sydney CBD. Dispersal of employment opportunities throughout the suburbs resulted in the need for cross suburban travel which was most conveniently achieved by the private motor vehicle. It is not surprising then that the main forecast

of the plan was an increase in car travel and the only proposed solution, the increase in road capacity to accommodate that travel.

The continuing preference for private car use has perpetuated the dispersal of employment so that in 1991 those areas designated as primary centres, which include the Sydney CBD, Parramatta, Wollongong and Newcastle, accounted for only 12 per cent of total employment in the Greater Sydney Metropolitan area, while the secondary centres (Bankstown, Blacktown, Campbelltown, Chatswood, Hornsby, Liverpool, North Sydney, Penrith, St Leonards) accounted for another 6 per cent. (See Figure 1.) The majority of employment destinations are dispersed throughout the metropolitan area.

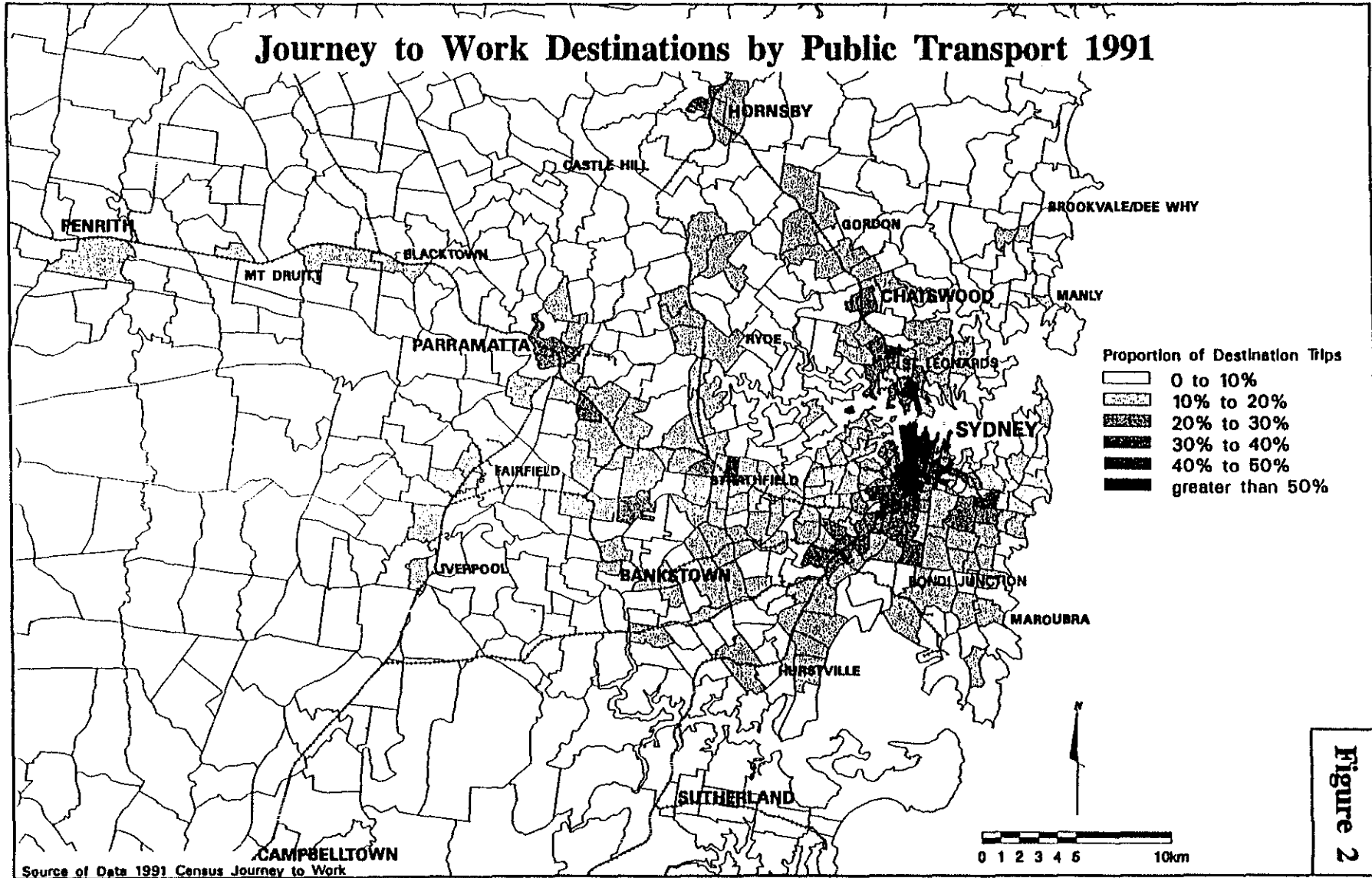
**Figure 1. Employment in Commercial Centres 1991 (1991 Census, Journey to Work)**



The pattern of concentration of journey to work trips by public transport in narrow corridors is also still evident in Sydney today. Figure 2 shows those areas of Sydney which have journey to work destinations by public transport as reported in the 1991 Census data.

The "Sydney Area Transportation Study" produced some impressive "blueprint documents" which set out the future transport needs of Sydney. However, as with the associated general land use planning document, the "Sydney Region Outline Plan 1970-2000 AD", these were static documents based on given forecasts of population projections. These forecasts were not borne out, and the main SATS report recommendation of a major road building program was not realised due to community opposition. The inflexibility of these plans did not provide a framework for reassessment, or ongoing evolution, to meet changed circumstances and the emerging needs of the metropolitan environment.

# Journey to Work Destinations by Public Transport 1991



Source of Data 1991 Census Journey to Work

**Figure 2**

Planning processes at this time were still focussed on the development of the "grand plan" which would accommodate all needs for the next twenty or thirty years. It was a one-off approach where, once completed the architects of the plan could sit back and "enjoy the fruits of their labours" so to speak. But, the urban environment is neither static, nor predictably driven by a limited set of indicators. It is a dynamic and interrelated system influenced and driven by many factors. As described by Maher (1986, p.19) "urban outcomes in terms of the distribution, function and character of areas at the national or local scale are only a snap-shot view of the product of processes continually acting to modify the physical imprint on the landscape." Thus "metropolitan planning should provide for the monitoring of trends and events and the assessment of impacts at the metropolitan scale (Stone 1985, p.241)". It should be a dynamic process not just a defined one-off activity focussed on achieving a limited end product such as population growth and land development.

### **3. THE "TRANSPORT STUDY GROUP"**

The Transport Data Centre (TDC), previously known as the Transport Study Group, was established to undertake the SATS in 1971. The history and fortunes of the group reflect the paradigm shifts in transport planning, in particular in relation to the role and application of data and modelling analysis, in that process. Another large scale Household Interview Survey was conducted in 1981 and again in 1991, although neither of these surveys resulted in the classic "blue-print" planning documents such as produced by the SATS in 1971. A number of smaller reports analysing the data from the 1981 survey were prepared.

The "Sydney Region Outline Plan 1970-2000 AD" was reviewed in 1980, but there was not a new overall planning document for Sydney until the release in 1988 of the metropolitan strategy called "Sydney Into Its Third Century". This document departed significantly from the previous planning strategies which had emphasised expansion of the metropolitan area to accommodate the predicted growth in population. The 1988 strategy focussed on the need for a concentrated, rather than a dispersed, strategy for accommodating population growth which would be achieved by policies supporting urban consolidation and concentration of employment in designated commercial centres.

To support the strategies outlined in this plan, "extensive land use transport modelling was undertaken to evaluate the effect of the concentrated and dispersed options on transport requirements. These studies showed that the more dense urban development provided for in the concentrated option would result in the more extensive use of public transport. Accessibility studies carried out by the State Transport Study Group revealed that a job in a major centre is twice as accessible by public transport as an out-of-centre job" (Sydney Into Its Third Century, 1988, p.37.) A background report was prepared, "Metropolitan Strategy for the Sydney Region", September 1989 which documents this analysis. This analysis concluded that the concentrated strategy was the most cost effective option, and thus the preferred strategy.

The State Transport Study Group's travel demand model was also used to undertake scenario testing of a number of transport infrastructure project options and scenarios of population and employment forecasts. As the strategy was concerned with maximising accessibility it "advocated a land use pattern which promoted accessibility. It also provides for improvements in both public and private transport systems" (Sydney Into Its Third Century, 1988, p.52.) However, it

recommended that no new corridors needed to be reserved for rail development and that "the public transport needs that will arise in the outer growth areas of Sydney will be best met by a hierarchy of bus services." (Sydney Into Its Third Century, 1988, p.52 )

The analysis using the Study Group's travel demand model as documented in the Background Report (1989) appears to have stretched the use of the model to the full extent of, if not beyond, its technical capabilities. The outputs are very heavily driven by the assumptions made regarding employment forecasts and the location of employment and it seems to attempt to analyse linkages and feedback between land use and the transport system which could be considered to be beyond its specifications. The model at this time was still primarily based on the four step structure developed in the 1970s and, although attempts were made to incorporate a vehicle choice model, it had very limited behavioural analysis capabilities. Its application for the evaluation of detailed specific public transport options is also questionable given that these choices were driven solely by the physical attributes of the network in terms of travel time, and did not reflect any mode preferences of travellers.

The next, and latest, of the metropolitan planning strategies are contained in the joint publications "Cities for the Twenty First Century" and the "Integrated Transport Strategy" released by the then Government in 1994. These however can be described as broad strategic documents of the direction for metropolitan and transport planning in the Greater Sydney Metropolitan area. The focus of the "Integrated Transport Strategy" is to highlight the need to redress the imbalance between the use of private vehicles and public transport. Unlike the 1988 metropolitan strategy, it does not purport to be based on extensive data analysis or travel demand predictions. A further Household Interview Survey had been conducted in 1991, but only very limited data analysis was available at the time of publication of these documents.

It was clear that the use of data and model analysis as part of the transport planning process had declined in favour at the end of the 1980s. This information was perceived by this time to only be relevant to the road building authority. The travel demand model, as developed in SATS, continued to be used primarily for production of trip tables used by the Roads and Traffic Authority for their infrastructure planning. As a reflection of this thinking, the Transport Study Group was at this time moved from the Department of Transport to the Roads and Traffic Authority.

The 1991 Home Interview Survey went ahead as planned, as well as the first survey of commercial vehicle traffic. The data from the 1991 Home Interview Survey were used to recalibrate the STM and to generate a revised set of zonal trip tables to be used by the RTA for road planning in the Sydney Metropolitan Region. The STM still maintains the same basic structure as when it was first developed in the 1970s. Its outputs are highway and transit trip tables for the two hour morning peak period. This is the result, both of the technical constraints of the model structure, as well as the previous prevailing philosophy that the supply of infrastructure should be planned so as to accommodate the morning peak trip to work. It is assumed that if it can handle these trips, then it will have adequate capacity for trips at all other times.

A growing appreciation is occurring within transport policy making and infrastructure planning authorities that travel demand management policies must look beyond planning for peak hour

infrastructure if the transport needs of large metropolitan areas are going to be met in a way which is economically efficient and environmentally acceptable. Partly reflecting the land use and public transport policies of previous eras, but also influenced by changing lifestyles and work force patterns, there has been a growing increase in private vehicle travel and a relative decline in public transport use (Gee et al., 1996). At the same time restructuring and changes in the retailing, manufacturing and service industries have resulted in an increase in the volume of commercial vehicle traffic on metropolitan roads. This ranges from large articulated vehicles through rigid trucks to a myriad of light commercial vehicles which compete with passenger traffic for road space in the urban area.

The strategy of continuing to increase road capacity in line with rising car use is no longer considered politically, economically or environmentally acceptable. We must look for other ways of accommodating travel demands. To do this requires an understanding of travel behaviour. The reliance in the past of just knowing the mass of travel, that is trip volumes, is not enough to support the complexity of analysis required for policy evaluation. There is a need for data which tells us who is travelling, when they are travelling, why travel is undertaken and what are the constraints and factors which influence travel choice decisions. We also need to understand what are the impacts of any one, or combination of, policies which may be used to influence travel behaviour.

#### **4. THE "TRANSPORT DATA CENTRE"**

In early 1994 the Transport Study Group was relocated in the Department of Transport which has again taken responsibility for its day to day management. It has been recognised that the data and model outputs collected and provided by the group are a key input to policy formulation and transport infrastructure and service planning. However, to achieve this effectively it was recognised that the structure and modus operandi of the group had to change so as to become more client focussed and to provide data and analysis on an ongoing basis which are relevant and credible to stakeholders whether transport policy makers, service providers or infrastructure planners.

With the move back to the Department in 1994 came a series of reviews of the then Department of Transport Study Group (DISG). A management review, a review of the data collection and modelling strategy, a review of technology requirements and a review of pricing and dissemination policies were conducted. One of the outcomes was a revision of the staffing structure so that a Client Services area has been established to deal directly and efficiently with clients' requests for data and model outputs. Data from the 1991 and 1981 Home Interview Survey data bases are made available to clients, both within the Department and to others in the transport planning community, on a fee for service basis based on marginal cost pricing. Policy focussed publications using the data are also released for general distribution. Collection and storage of all travel data and other inputs to the STM are the responsibility of the Data Operations area and the maintenance and development of the travel demand model and associated road and public transit networks is carried out by a team of transport modellers. To signify the new approach of a centre which provides ongoing data and analysis as input to the planning process, rather than a group which undertakes one-off studies, the Group's name was changed to the Transport Data Centre.



## 5. TDC - REVIEW OF DATA COLLECTION AND MODELLING STRATEGIES

This paper specifically considers the outcomes of the "Review of the Data Collection and Modelling Strategies" which was conducted by Professor David Hensher of the Institute of Transport Studies at the University of Sydney (TDC, 1995). The project was set up to review the models and data holdings of the then DTSG for the Metropolitan areas of NSW and recommend what would be needed to meet current and developing needs and make effective use of the information obtained. The project first reviewed current resources, this then led to a proposed development strategy and an outline of steps for implementation.

Initially a very thorough review was undertaken of the current data holdings and model system along with extensive client consultation including workshops and interviews with key Australian stakeholders, as well as a Delphi exercise with international experts so as to determine required data and model outputs. The strategy was also developed in line with international best practice in the field of travel data collection and travel demand modelling and an international literature review was carried out as part of this process.

The Review embarked on the search for improvements with the following objectives:

- ▶ To increase the policy relevance and sensitivity of existing travel forecasting procedures and their ability to respond to emerging issues including environmental concerns, growth management and changes in personal, household and firm activity patterns along with the traditional transport issues;
- ▶ To redesign the travel forecasting process to reflect today's traveller behaviour to respond to greater information needs placed on the planning and forecasting process and to take advantage of changes in data collection technology; and
- ▶ To make travel model results (explanatory and forecasting) more useful to decision makers  
(Institute of Transport Studies, 1995, Vol. II, Chpt.1 p.1)

The combined activities of this review and consultation process provided the foundations for the design of a new strategic travel information and model system (STIMS). "Two broad criteria, (i) substantive content and (ii) deliverability and accessibility, were identified as critical drivers of the three dimensions of STIMS: a data strategy, a modelling strategy and an information strategy. The redesign program involves a substantial shift in emphasis away from a data strategy centred on infrequent updating of travel data to one of continuous data collection activity." (Institute of Transport Studies, 1995, Vol. II p ix)

The modelling strategy recommended is to move towards the development of a suite of behavioural based models which are more useful for analysis of policy changes. The information strategy must involve internal documentation of all data and modelling activities and the improvement of the accessibility of information by clients in a range of formats. Developments in computer technology now present a wide range of possibilities of data access for consideration.

Developments in Geographical Information Systems (GIS) technology, an area which is well developed in the Transport Data Centre, also makes possible the easier storage and handling of data bases, the manipulation of data for the networks and models, and the presentation of complex issues in a format which is easily understood by policy and decision makers.

## 6. DEMANDS FOR DATA AND MODEL ANALYSIS

In the research community there has been considerable emphasis and development over the past twenty years of behavioural modelling techniques in relation to travel choices. (There are too many references to cite here, however a good general overview is given in Mannering and Hensher 1987.) However within the Government sector lack of support for model development, possibly reflecting a lack of confidence and understanding in the use of model outputs in the transport planning and policy making process, has resulted in little or no advancement of modelling techniques, and hence application in practice, over this period. There is therefore a need for the Government sector to catch up with the developments in modelling that have occurred in the research community. An important part of this process is to regain the acceptance of the usefulness of models and to demonstrate their relevance to policy makers.

Policy makers are now required to consider a much broader range of policy options than just infrastructure planning, to address travel demand management issues. These options require an understanding of travel choices, location choices, work practice choices and most importantly the interrelationship of these decisions in determining the final travel outcomes of our metropolitan areas. The current traditional four step model does not address most of these choices and does not provide for any interactions between transport and land use decisions. To be able to assist policy makers to answer some of these questions adequately, requires a considerable investment in the development and application of new modelling techniques within the Government planning process.

A particularly important driver of this process is the demand for better data and models to understand the impact of transport on the environment, especially given the concern over declining air quality in large metropolitan areas as a result of the increase in private vehicle travel. For example in the United States, the Clean Air Act in California has prompted considerable developments in vehicle and travel choice modelling to provide tools for assessment of policies to reduce the adverse impact of travel on air quality. Significant developments have been made by the team at the Institute of Transportation Studies at the University of California, Irvine, (Brownstone et al., 1994), on their project to develop a model system to forecast demand for clean fuel vehicles in California. This project includes the estimation of models to predict vehicle usage which is related to household characteristics and the number of vehicles owned by the household (Golob et al., 1995).

The US Department of Transportation has also embarked on an extensive program of travel model improvement to "address the linkage of transportation to air quality, energy, economic growth, land use and the overall quality of life." The program aims to develop better analytical tools which can be integrated into the planning process to better support decision makers. (US

Department of Transportation, 1994 ) Similarly in Australia considerable work has been initiated by the Bureau of Transport and Communications Economics in developing strategic level transport model systems which address some of the choices discussed above, as part of their Greenhouse Gas Emissions project (Hensher, 1995).

The Environment Protection Authority in New South Wales has also developed an extensive modelling system as a result of the Metropolitan Air Quality Study to analyse and predict air quality in the Sydney Metropolitan basin. However, the demand side input in relation to travel behaviour is very limited. The main input variable to this model system representing transport is vehicle kilometres travelled (VKT), which is generated from the Transport Data Centre's travel model. This model output is subject to all the limitations of the model structure as discussed. Thus there is still a need for development of models which can take into account the changing composition of the vehicle fleet, and changes in vehicle use and travel patterns in relation to land use changes to determine the impact of transport on air quality.

## **7. TDC - NEW DATA AND MODELS**

The "Review of the Data Collection and Modelling Strategies" (TDC, 1995) outlines a three year program for the implementation of the new strategy. The strategy recommended in the review was endorsed by Government in April 1995. Since that time the TDC has made considerable progress towards implementation.

As reported at the time of the review, the documentation of the 1991 Home Interview Survey was incomplete and the data were not easily accessible. Hence very little use had been made of it in the policy and planning process. This was largely due to the uncertainty of the support for the group at the time and the disruption of physical relocation and changing staff and management structures. Few changes have been made to the travel model which still retains its basic structure as of the 1970's. Any changes which had been made were on an ad hoc basis and documentation of the process is incomplete.

A high priority was to give attention to the need for improvement of the internal documentation of the existing data bases and models. As a result all data bases have now been fully documented. Considerable analysis has been undertaken of all the major databases including the 1991 Home Interview Survey and comparisons with the 1981 Survey, the 1991 Commercial Vehicle Survey and the 1991 Census Journey to Work Data. Summary publications have been prepared and data are available from these data sets to clients on request.

In line with the recommendations of the review, a continuous data collection program is planned. A review has just been completed to test a number of survey methodologies to determine the most appropriate method for such an ongoing survey, given the data required to be collected for input to modelling and other analysis for policy and planning purposes. The choice of survey methodology must also take into consideration the need to be suitable for an ongoing program, as well as budget constraints to finance that program. Consequently self enumeration methods, as well as face-to-face interviews, have been tested and evaluated for cost efficiency as well as

effectiveness for collecting the data required by clients and for modelling purposes.

The concept of an activity diary, as well as the traditional trip diary, has also been tested and is being evaluated in terms of data quality collected. In total a set of six combinations of questionnaire design and survey methodology have been tested: face to face trip diary, face to face activity diary, mail-out mail-back trip diary, mail-out mail-back activity diary, drop off mail-back trip diary and drop off mail-back activity diary. All these methods were tested in Sydney over the same period in May/June 1996 so that the results (which were not available at the time of publication) should provide a directly comparable means of evaluation.

Given the ongoing nature of the survey, a reduced annual sample size will be collected. The Australian Bureau of Statistics have also just completed a review of the sample procedures and sample size required for such an ongoing survey. Professor Hensher has also provided advice as to the implications for the model development of various sample sizes and sampling frequencies for variables required for modelling.

As well as personal travel, it is recognised that there is a need to have a better understanding and a more complete data picture of the movement of freight traffic in the Sydney Metropolitan area. A Commercial Vehicle Survey (CVS) was conducted in 1991 to complement the 1991 Home Interview Survey. Some results of this survey are reported in a recent TDC Issues Paper (TDC, 1996). Given the nature of the design of the sample for this survey, it predominantly reports on movements of light commercial vehicles which are registered in the Greater Sydney Metropolitan Region.

It is recognised that the 1991 CVS gives an incomplete picture of the total movement of commercial vehicles for the Sydney urban area. The collection of travel data for this sector of the economy is much more difficult than the collection of personal travel data, given the diversity and complexity of the freight transport task. There are many different industries which contribute to total freight movements in an urban area using a range of vehicles from small light vans to heavy articulated vehicles which move through the metropolitan area, but which may have origins and final destinations throughout the country. The IDC is committed to capturing data on the freight task and has begun a review of methodologies and practices in this field from around the world. This review is not being confined to primary data collection methods but encompasses a variety of approaches including administrative by-product data and input-output analysis, as well as traditional trip movement diaries.

In relation to the modelling recommendations in the review, the TDC plans to undertake a long term program of model design to enrich the behavioural content of the travel demand model. This will be carried out in parallel with continuing improvements to the existing model structure. Currently the only behavioural component of the model deals with mode choice. However, this is particularly limited in that the model is only estimated for choice between private vehicles and public transport, it does not provide for choices within public transport modes. This is one of the key areas identified for improvement in the short term as data are currently available from the

1991 Home Interview Survey which would allow the estimation of a multi-modal mode choice model.

The goal for TDC in pursuing the implementation of these strategies is to be in a position to provide a data and modelling system which is a dynamic and integral part of the on-going transport and urban planning process in Sydney. It will provide data and model outputs which are current and relevant to the evolution of planning policy. Like their predecessors, the last round of planning strategies have had to rely on a very limited foundation of data and analysis. As Bray (1996) reports, "that in reading transport strategies and related material, I have been struck by the plethora of ideas, and the general dearth of supporting quantification of them. What does this indicate? Is it that we do not understand what is happening; that we do not have the tools and understanding to assess the options available; or that the answers are inconvenient? Are there currently more ideas than knowledge in transport?"

The lack of underlying data and analysis of recent planning strategies in large part reflects a lack of confidence in the available data and modelling analysis tools to adequately address the current policy issues. The tools that are available were designed to answer the infrastructure, or supply, side planning issues of the 1970s. "The focus of transport policy until the 1980s on the supply of infrastructure and services made things simpler for governments. In so far as public sector transport planners and operators were responsible for the supply of infrastructure and services they were able to both identify and implement the necessary changes. However neither governments or planners can influence transport demand as surely as they were able to manage the supply of transport infrastructure and services. The community holds the power to make decisions regarding their travel and these decision are made in the market." (Bray, 1996)

The planned data collection and modelling strategy changes for the TDC are designed to provide the tools required to understand travel behaviour choices so that the Government and planners are better equipped to implement travel demand management policies whether related to capital investment decisions or the provision of services. We are fortunate in Sydney that we have a relatively recent, rich data set of personal travel in the 1991 Home Interview Survey. Although the data from this survey have not been used to its full potential to date, it is a valuable source of variables for analysis and model estimation in the short term. The implementation of a continuous program of data collection will ensure that TDC's data holdings are current and relevant to the prevailing policy debates, and the development of a system of behavioural choice models will provide policy makers with a more sophisticated and flexible tool for future policy analysis.

## 8. CONCLUSION

The data and modelling needs for transport planning and policy decision making have changed considerably since the era of large scale metropolitan plans of the post war boom period. These plans were designed to provide the means of accommodating the forecast population growth of the metropolitan area and accompanying increase in private vehicle traffic. In all cases the growth in population and the demand for housing and transport have overtaken the plans so that in the 1990s we are still faced with the need to manage travel demand, control traffic congestion,

improve air quality and in general address what is perceived as declining quality of life in the metropolitan area. The travel demand tools developed in the 1970s which are still in use today are no longer appropriate for the policy analysis task of the 1990s and beyond. The New South Wales Government has recognised the need for a program of model development and current data collection to provide tools which are a valuable, credible and an on going integral part of the transport planning process.

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