SPECULATIONS ON FUTURE AUSTRALIAN TRANSPORT RESEARCH BASED ON TRENDS BETWEEN 1975 AND 1984

J.A. Black
Department of Transport Engineering
School of Civil Engineering
University of New South Wales

P.J. Rimmer
Department of Human Geography
Research School of Pacific Studies
Australian National University

ABSTRACT:

In accepting the challenge to speculate about the desired trends in transport research within Australia as part of the 'open forum' on 'Transport in the Year 2000' this article considers all papers that have been presented to the previous nine Australian Transport Research Forums. Initially, it details the number of 296 papers, the number, gender, location and affiliation of 477 authors and a brief designation of their contents (transport mode and geographic scale). Then it endeavours to distill and classify the essence of the particular research thrust embodied in the articles. On the basis of this analysis desirable research areas are suggested as a starting point for further discussion and debate.

Prognostics do not always prove prophecies - at least the wisest prophetics make sure of the events first.

Horace Walpole, Letters, To Thomas Walpole, 19 February 1785

PARTHENOGENESIS

A meeting of the transport faithful from the Australian diaspora was called at Tullamarine Airport in 1974. As jets roared overhead in celebration the attendees witnessed the parthenogenetic birth of the Australian Transport Research Forum; though several of those present have subsequently rejoiced under the title of 'founding fathers'. Since then, with the notable exception of 1981, there has been an annual celebration of the event. A record of these yearly gatherings is preserved in a bound volume of papers, providing an opportunity to review the nature of ongoing Australian transport research - a step towards suggesting new goals and changes to the character of the forum.

The dissemination of research - in the form of papers and publications - is not only confined, of course, to the channels of the Australian Transport Research Forum. There are outlets provided by, for example, the biennial Conference of the Australian Road Research Board (since 1962), the 107 reports and occasional papers of the Bureau of Transport Economics (as listed in Bureau of Transport Economics, 1984a), the Conference of Australian Institutes of Transport Research (since 1979), and Australian and overseas journals. Nevertheless, the Australian Transport Research Forum should provide a reliable mirror reflecting the breadth and depth of the nation's transport research activity.

As transport relatable costs in Australia have been estimated at 15 to 20 per cent of GNP (Cooke, 1976, p. 664), an aggregate national estimate of transport research funding of $82.4 million [1] for 1980-81 (Perry, 1983, p. 304) is a justified expenditure. During the period 1974/75 to 1980/81 the Commonwealth made available a total of $50.8 million in grants to the states under the Transport (Planning and Research) Act 1974 and the Transport Planning and Research (Financial Assistance Act) 1977. Funds were made available for planning and research related to all areas of land transport, including the interface between land transport and other modes - details of projects are listed in The Transport Planning and Research Program: Report of Progress to 30 June 1981 (Department of Transport Australia, 1982). The function of research, according to Scrafton (1977), is to enable the development of transport technology and operational practices (technical and scientific research) to provide the necessary information for governments and politicians to enable them to formulate policies and make decisions objectively (policy research).

Before assessing how well this objective has been achieved a basic question has to be raised: what have been the key features of the annual sets

1. This includes: the $34.3 million of Commonwealth funding (CSIRO, direct and indirect grants to ARRB and ARRDO, funding of the higher education research and development sector and some funding of private sector research and development); the $25.1 million from the state governments' own resources; and the $16.0 million of private enterprise sector funding (Perry, 1983, p. 303).

of papers in terms of authors and topics? Once this matter is resolved we can proceed to a more searching question: what has been the essence of the papers presented at past forums? We are then in a position to tackle the most crucial question: what should be the contents and themes of the forums over the next ten or fifteen years (an issue also to be raised in the forum panel discussion).

The initial question is tackled by detailing: the number of papers; the number, gender, affiliation and location of authors; and the geographical scale of the topic addressed and its modal emphasis. Once this preliminary analysis is completed, attention can be concentrated on the second question by distilling the contents and themes of the papers. After this diagnosis we can proceed to coining new themes, refurbishing old ones and jettisoning others - a prognosis that is open to challenge and debate.

ANALYSIS

The first nine forums produced 296 papers - an average of about thirty three each year. As shown in Table 1, the number increased from sixteen at the first Sydney conference in 1975 to forty-three when it returned four years later. A steady-state persisted over the next two conferences until the veritable bonanza occurred in Canberra with no less than fifty-five papers being accepted. From this all-time high the number slumped to twenty-seven at Adelaide in 1984. Although a variety of reasons could be proffered to explain this roller-coaster effect, attention has to be directed to the nature of the authorship before reaching a conclusion.

Table 1. Number of Papers Presented at Each Forum, 1975-1984

Forum	Date	Papers	
		number	per cent
1. Sydney	1975	16	5.3
2. Adelaide	1976	25	8.3
3. Melbourne	1977	27	9.0
4. Perth	1978	31	10.3
5. Sydney	1979	43	14.3
6. Brisbane	1980	36	12.0
7. Hobart	1982	36	12.0
8. Canberra	1983	55	18.3
9. Adelaide	1984	27	9.0
		296	100.00

An analysis of the 477 authors reveals a different pattern. The number of authors climbed from twenty-five in the inaugural Sydney forum to sixty in Perth three years later (Table 2). This number was more or less maintained until the Canberra bonanza of ninety-two in 1983. A year later, in Adelaide, the number was exactly halved. Again, it is premature to rush to conclusions on this evidence as there was considerable fluctuation around the mean ranging from 1.3 authors per paper in the second Sydney forum in 1979 to almost two authors per paper in Perth in the preceding year. Perhaps we should lament the apparent lack of female authors.[2] Although there are no ages, we suspect there has been a pronounced greying of this male fiefdom during the past ten years.

2. At the Canberra forum in 1983, which gave the largest contingent of authors and co-authors, approximately 10 per cent were female.

Table 2. Single and Multiple Authorship of Papers at Each Forum, 1975-1984

Forum	Date	Authors 1	2	3	4	Total papers	Total authors	Ratio
1. Sydney	1975	8	7	1	-	16	25	1.6
2. Adelaide	1976	14	10	1	-	25	37	1.5
3. Melbourne	1977	16	10	1	-	27	39	1.4
4. Perth	1978	9	16	5	1	31	60	1.9
5. Sydney	1979	32	9	2	-	43	56	1.3
6. Brisbane	1980	15	18	3	-	36	60	1.7
7. Hobart	1982	13	20	3	-	36	62	1.7
8. Canberra	1983	27	21	5	2	55	92	1.7
9. Adelaide	1984	13	9	5	-	27	46	1.7
Total papers		147	120	26	3	296	477	1.6

A less contentious issue is the location of authors - though this may hold some surprises for afficianados of individual states. As shown in Figure 1, the federal and state capitals - the venues of all forums - dominate the picture with collectively over 91 per cent of all papers. The Melbourne-Canberra-Sydney axis is paramount containing 70 per cent of all authors. Melbourne, however, is clearly the 'Mecca' of transport research corralling over one-third of all authors. While Sydney has been the venue for two forums, it has generated only one-fifth of the authors. Canberra (14 per cent) is ahead of Adelaide (9 per cent), Brisbane (6.5 per cent) and Perth (almost 6 per cent). Although Hobart (1.5 per cent) has been a conference venue, it is only on a par with Darwin and Townsville, which, in turn, rank ahead of Newcastle, Geelong and Wollongong as sources for contributors. In total, Australia has provided over 96 per cent of the authors - the overseas authors being attracted from Wellington (five), Munich (four), Leeds (two) and six other locations (one each). Rather than become involved in the failure to attract a larger overseas authorship, or the perennial arguments over the respective merits of Australian cities, it is more pertinent to discuss the affiliations of authors.

In Table 3 the classification of affiliations shows that the government sector - federal, state and local - supplied over one-third of of all authors; state governments dominated followed by the federal government, with only a token contribution by local government. Within the state sector Victoria and South Australia almost matched New South Wales, and there was a strong contribution from Western Australia. The Bureau of Transport Economics generated almost half of the authors in the federal sphere. Although not matching the government's overall manpower and resources, the tertiary education sector (colleges of advanced education, institutes of technology and universities) contributed over one-quarter of the authors. This figure was closely followed by the private sector dominated by consultants, feeding primarily off the federal and state governments, as one would expect. The private transport industry made only a meagre contribution[3] - one in ten of all papers from the private sector - which is disappointing given the size and importance of its role in freight and bus passenger operations and in the manufacture of transport equipment. The specialist research institutes provided the balance of authors with the Australian Railway Research and Development Organisation, the Australian Road Research Board and Commonwealth and Scientific and Industrial Research Organisations figuring prominently.

3. An ATRF participants survey revealed that more transport operators should attend and that more operator material - interpreted as being more practical - should be presented (Starrs and McKenna, 1977, p.702).

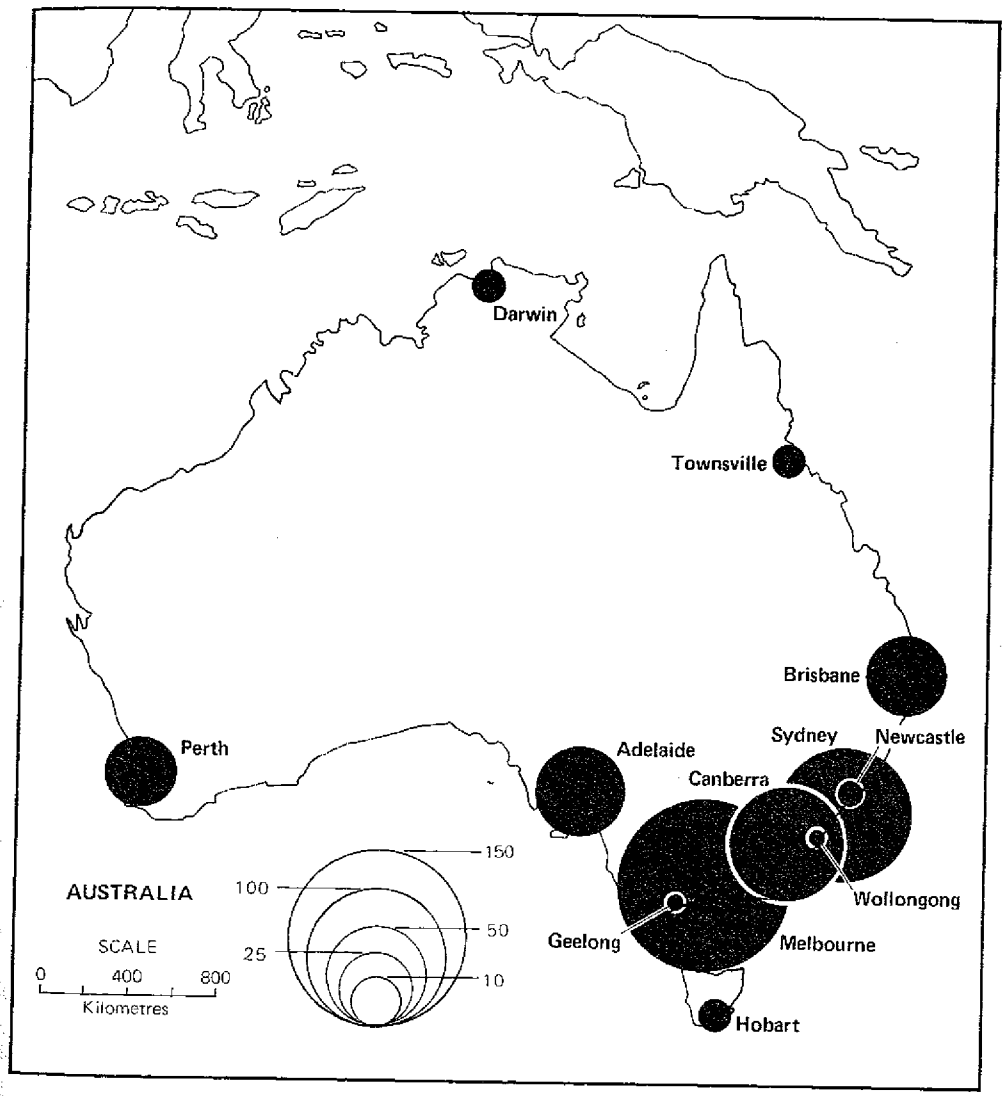

Figure 1. Location of Authors and Co-Authors of Papers Published in the Australian Transport Research Forum: Forum Papers, 1975 to 1984.

Table 3. Affiliation of Authors of Papers Presented, 1975-1984

Affiliation	No.	Per cent	Affiliation	No.	Per cent
GOVERNMENT			PRIVATE		
Federal			Consultants	82	17.2
Australian National Railways	4	0.8	Industry	8	1.6
			NRMA	6	1.3
Australian National Line	2	0.4	Transport Industry	12	2.5
			Sub-total	108	(22.6)
Bureau of Transport Economics	28	5.9			
Commonwealth Bureau of Roads	6	1.3	RESEARCH INSTITUTES		
Department of Aviation	3	0.6	Australian Road Research Board	23	4.8
Department of Transport	11	2.3	Australian Railway Research & Development Organisation	10	2.1
Other	11	2.3	CSIRO	13	2.7
Sub-total	65	(13.6)	Sub-total	46	(9.6)
STATE AND STATUTORY AUTHORITIES			TERTIARY EDUCATION	135	28.3
ACT	1	0.2	OTHER		
NSW	24	5.0			
NT	6	1.3	Union	1	0.2
QLD	11	2.3			
SA	22	4.6	Overseas Government	5	1.0
TAS	3	0.6			
VIC	22	4.6	Overseas Research Institute	1	0.2
WA	20	4.2			
Sub-total	109	(22.9)	Sub-total	7	(1.5)
Local	7	1.5	TOTAL	477	100.0

It is not surprising that these authors find that Australia offers great potential for examining transport topics. Indeed, the vast island continent not only offers a laboratory of 7,686,848 sq. km but contains seventeen urban areas with populations greater than 40,000 at the 1971 Census of Population and Housing. The geographical coverage, or scale, of each paper can be arranged, as shown in Table 4, from the broadest, or national, level down to terminals that are site-specific transport elements. Almost one half of the papers classified in this table do not have contents that address explicitly any of these seven scales because of their generality or their theoretical nature or because, for example, they relate to organisational or management

systems. Of the remaining 152 papers that can be allocated into one of the seven geographical scales, over 40 per cent deal with transport in urban areas, especially the capital cities. The next largest category (25 per cent) contains papers considering transport at the state or territory level (for example, Bartlett and Bannister, 1983), or transport between two states, such as shipping between Tasmania and the mainland (Clarke, et. al., 1984), or transport in a region broader than state or inter-state such as airline passenger traffic to and from five regional centres in Queensland (Franki and Eyland, 1983). Local areas - predominantly portions of Sydney and Melbourne - specific routes or transport corridors, and transport terminals (bus interchanges, bus depots and ports) each contain similar representation - about 10 per cent of the papers.

Table 4. Scale of Analysis and Coverage of Papers Presented, 1975-1984

Geographical scale	Number	Per cent
National	7	2.4
State, inter-state, regional*	40	13.5
Urban Areas**	65	22.0
Rural community (ex-urbia)	2	0.7
Local Areas***	18	6.1
Specific Transport Corridors	15	5.1
Transport Terminals	14	4.7
Not classified by scale	144	48.6
Total papers	296	100.0

* railways (16); roads (10); air (5); shipping (2); coaches (1); other (6)
** Adelaide (15); Sydney (13); Melbourne (12); Canberra (7); Brisbane (6); Perth (3); Ballarat (2); Geelong, Darwin, Hobart, Wollongong; three comparative studies
*** Melbourne (10); Sydney (5); Adelaide; Brisbane; Perth

The final part of the analysis is to establish what components of the transport system have been studied. As any classification scheme is difficult to establish because of the interactions between the transport and traffic sub-systems, Table 5 should be interpreted as a guide to the modal emphasis of the papers. Clearly, the 'big three' are roads, road traffic and vehicles (68 papers), multi-modal transport (66 papers), and public transport (57 papers). By multi-modal we mean papers dealing with, for example, competition between road and rail, or those dealing with, say, the planning of transport in urban areas. Within the public transport category, papers are classified as urban public transport unless the sub-mode is specified as is the case of buses, taxis and trams. Reference has already been made to the disproportionate contribution by the private sector: there are no papers on non-government railways, and only four papers on private bus operations. These four papers are in stark contrast with twenty four on government bus and tram operations, despite the private buses carrying 29 per cent of total annual passenger journeys when government buses and trams carried 35 per cent (Wallis, 1983, Figure 1, p. 193). Nearly one in ten papers could not be classified as they dealt with general issues, or, in the case of a couple of papers, not dealing with transport at all!

Table 5. Transport Mode as Main Topic of Papers Presented, 1975-1984

Paper Classified by Mode	No. of papers	Per cent
Airports and Airlines	18	6.1
Freight and Physical Distribution	9	3.0
Multi-modal Transport	66	22.3
Ports and Shipping	15	5.1
Public Transport		
- Buses	25	8.4
- Taxis	5	1.7
- Trams	3	1.0
- Urban	24	8.1
Railways	29	9.8
Roads	16	5.4
Road Traffic and Vehicles	52	17.6
Other Modes		
- Bicycles	4	1.4
- Parking	1	0.3
- Pedestrians	2	0.7
General or Not Mode Specific	27	9.1
Total Papers	296	100.0

DIAGNOSIS

In examining the papers presented to the Australian Transport Research Forum the aim is to distill their essence not to sit in judgement on their contents. A clue to unravelling this should be the general theme of each forum, as listed in Table 6, but this proved of little help as few authors addressed the theme. This has been a criticism of some papers (Starrs and McKenna, 1977, p. 702). It may explain why the Adelaide forum of 1984, and this latest one in Melbourne, had no overall theme.

Table 6. Themes of the Australian Transport Research Forums, 1975-1985

Forum	Date	Theme
1. Sydney	1975	Pricing and Investment
2. Adelaide	1976	Transport Research Planning and Operations
3. Melbourne	1977	Getting the Best Use from Infrastructure
4. Perth	1978	Real Solutions to Real Transport Problems
5. Sydney	1979	Planning Transport - Issues and Myths
6. Brisbane	1980	New Decade - New Directions
7. Hobart	1982	Achievement through Research
8. Canberra	1983	Transport Problems
9. Adelaide	1984	Not Specified
10. Melbourne	1985	Not Specified - eleven topics suggested

A convenient four-fold classification has been devised to summarise the types of papers presented: (a) general issues; (b) pure theory; (c) practice; and (d) theory and empirical testing. We felt that the three-fold classification of pure, applied and reviews adopted by Starrs and McKenna (1977, Table 2, p. 704) was not suitable for our purposes. Table 7 provides an overview of the types of paper classified in this way for each of the nine forums and it shows that half of the papers described transport practice and about 20 per cent involved theory and empirical testing. The remaining papers were split

between general issues (16 per cent) and pure theory (13 per cent). Each of these categories is defined and illustrated by reference to selected papers.

Table 7. Classification of Papers by Type, 1975-1984

Forum	Year	Type of Paper				Total Papers
		Issues	Pure Theory	Practice	Theoretical/ Practical	
Sydney	1975	3	6	4	3	16
Adelaide	1976	3	5	17	0	25
Melbourne	1977	8	1	11	7	27
Perth	1978	5	2	16	8	31
Sydney	1979	16	6	12	9	43
Brisbane	1980	5	5	19	7	36
Hobart	1982	1	6	21	8	36
Canberra	1983	5	1	37	12	55
Adelaide	1984	0	4	20	3	27
Total Papers		46	36	157	57	296

Ideally, general issues papers should isolate desirable goals and objectives about the transport system and its operational aspects. Often, however, authors make no attempt to invoke theory nor to present empirical evidence to substantiate their claims, and the papers focus on issues. The second Sydney forum chose an issue-oriented theme, and, according to the chairperson, actively sought to stimulate authors in areas which the organisers felt needed to be discussed. As a result 40 per cent of the papers covered such issues as industrial relations (Dodds, 1979; McIver, 1979; Thompson, 1979; Webb, 1979), energy (Huxtable and Cox, 1979; Peterson, 1979), and public transport (Oxlad, 1979; Pak-Poy, 1979).

Pure theory papers are seen by some as having no apparent application and hence no place in the forum. The first two papers presented in 1975 were on theory - the public enterprise concept (Kolsen, 1975) and its application to roads (Docwra, 1975) - and since then there has been a trickle on economic theory (Forsyth and Hocking, 1978; Steeper, 1978; Taplin, 1980; Forsyth, 1982; Docwra and Kolsen, 1982). Travel demand modelling is another area perceived by some as theory. Good examples of this, again from the first forum, are an optimisation model for recreational travel demand (Symons, et. al., 1975) and the review of approaches to modelling consumer preferences and demand (Hensher and McLeod, 1975). Other reviews of models soon followed: Hensher (1976) and Gray and Bowen (1976). Contributions on related topics, such as activity analysis and time budgets (Truong, 1979; Wigan and Morris, 1979) or on the theory of games and information theory in transport planning models (Taylor and Sharpe, 1982), are also classified as pure theory.

Papers on practice are on amorphous group and need to be broken down further into a sub-classification in order to illustrate their themes. Bearing in mind Scrafton's (1977) definition of the purpose of research, a useful approach is to examine the steps in the transport planning process and see how the practical papers fit into this framework. Thus, papers can be grouped into an identification of the objectives, data collection procedures, the analysis of travel demand and transport supply, forecasting, and the economic, social and environmental evaluation. Occasionally, authors tackle some or all of these steps (for example, Nairn et. al., 1976; Wildermuth, 1982; Nairn and Cotterill, 1983; Kneebone and Howard, 1984). The remaining papers on practice can be sub-classified into demonstration projects and their

evaluation, for example, transport for the disabled (Fisher and Parry, 1983) or those dealing with management systems, for example, West rail's corporate planning approach (Grimwood and Georgiades, 1976; Swan et. al., 1978).

Papers that cover both theory and practice reflect the positivist paradigm of hypothesis testing or model formulation and its validation. Of special relevance is that the empirical work reported is placed correctly in the wider literature or is embedded in the theory discussed in the paper. As an illustration, consider the three papers at the last forum in Adelaide classified in this way: the principles of the Zero-Sum Society and its application to the evaluation of road safety proposals (Richardson, 1984); a simulation model of the costs of supplying liner shipping services and its application to shipping services linking Australia and Southeast Asia (Gallagher and Meyrick, 1984); and a thoughtful examination of the definition of community service obligations and its application to Australian railways (Michael, 1984). It is papers involving both theory and practice that in our opinion should be given preference in future forums.

PROGNOSIS

In addressing the question about future transport research needs there are alternative ways to proceed. One formal way is to set up a national committee charged with the responsibility of developing a five- or ten-year plan for research - the Strategic Transportation Research Study in the USA is a good example of this approach (Transportation Research Board, 1984). A less formal approach is for an individual or small group to seek out opinions from experts and to convene a seminar to establish suitable topics and recommend priorities. Variations on this include the Delphi-type exercise where invited members write down ideas on future research and their ideas are revised in the light of subsequent discussion leading to a consolidated consensus position. Our approach draws on the past to identify gaps and this speculates on the next ten to fifteen years.

Extrapolating the 1975-1984 trends to the year 2000 we would expect audiences to sit through another 495 papers given by 792 authors. If a steady-state situation prevails there would be 110 papers on multimodal transport, 95 papers on urban public transport, 87 papers on road traffic and vehicles, and 1.5 papers on parking. Although 240 of these papers would not be distinguished by scale there would be 67 papers on regional transport and 109 on urban transport of which twenty-five will be on Adelaide. We would also expect a further 77 papers on issues, 60 papers on pure theory, 262 on theory and practice and 96 on practice. The prospect of another 500 papers on more or less the same topics does raise a supplementary question: why is it necessary to undertake further research?

Any speculation about future research directions requires some understanding of the context of transport in Australia in the year 2000. Fortunately, there is an authorative, and up-to-date survey of the likely shape of Australian transport up to the end of the century (Bureau of Transport Economics, 1984b). Based on a survey of tecnological developments for each mode that are 'near certainties' the report concluded that 'no revolutionary change in Australian Iransport is anticipated during the next 15 years' (Bureau of Transport Economics, 1984b, p.39). More detail on the five market segments - international freight transport, international passenger transport, domestic freight transport, urban and non-urban passenger transport - by experts in the various fields and commissioned by the Bureau of Transport

Economics provided the background material to examine the outlook for transport in the year 2000 (Bureau of Transport Economics, 1984c). Some understanding is also required about demographic and social trends in Australia.

In the past, the main justification has been the enormity of the transport task on the Australian continent. More compelling reasons may have to be spelt out in the future. Primarily there is the economic efficiency argument that research can help reduce massive national expenditures in transport construction, operations and maintenance providing that the results achieve superior, more workable products and processes. By its very nature, certain kinds of research look at uncharted areas where the results and findings cannot be guaranteed to be useful. This risk is minimised, however, if research activities can be directed to areas offering the highest pay-off - the road sector in Australia. Despite continuous improvement to the highway system, safety continues to be of great concern. There is also the distributional argument that research can help assess the impact of transport developments on different groups within the community with questions about: who gains; who loses; and by how much? Thus, quality, safety and welfare issues and the environmental consequences of transport are as important as transport costs. Assuming that further research is warranted on economic efficiency and equity grounds the question of content has still to be studied. On this score the extrapolation of the past will not do.

A characteristic of much of the Australian transport research presented at past forums is that its methodology amounts to little more than 'descriptive monitoring' - the description pattern, the measurement of statistical and numerical association and the conjecturing of process (Sayer, 1982). Much is also derivative. Too often research amounts to little more than the slavish application of a theory or technique fashioned in North America and Europe for North American or European problems. At best, we tamper with them and export them via consultants to Southeast Asia and the Pacific Islands. Not surprisingly, the number of overseas commissions for transport consultants have been limited.

If we are to overcome the colonial dependency syndrome, we must pay more attention to historical research. Unless we comprehend the nature of Australia's historical economic development, there is little likelihood that we will know where we have been and where we may be going. For example, an examination of (a) theory and practice during the railway era from the 1850s to the 1890s, (b) the recreational use of the motor car for the period 1900 to 1930 and (c) the widespread use of the motor car from the 1930s to 1960s would do much to deepen our understanding of Australia's past development. These past phases are reflected in the built-environment which mirrors the restructuring that has occurred following crises in the Australian economy in the 1840s, 1890s and 1930s.

The contemporary restructuring of the Australian economy following the recession that ended the long-boom (1950-1970) has received little attention from transport researchers. Yet, there has been a shift of capital investment from the southeastern urban-industrial triangle - Sydney - Melbourne - Adelaide - into the west and north, notably Western Australia and Queensland. Transport and resource development has not been a research topic. Some capital is moving out of Australia into Southeast Asia, siphoning off jobs in textiles, shipbuilding and threatening the car industry. Presumably, these changes have had far-reaching effects on the transport industry. For the most part, however, there has been little attempt to grapple with these

consequences on transport and land use.

In teasing out the consequences of the restructuring on transport and land use since the 1970s, more attention needs to be directed to the structure, conduct and performance of transport organisations, including public accountability, legislative provisions and legal practices. Not only should large organisations and small firms be singled out for attention but business organisation segmentation explored within a power network (Taylor and Kissling, 1983). Much could be achieved in this respect by undertaking detailed case studies. Although the emphasis on business organisations as collections of human beings smacks of a sociological approach, this perspective has been sadly lacking within Australian transport research.

More attention also needs to be directed to comparative studies that involve analysis and synthesis. These can be undertaken at a range of spatial scales. At the international level, for example, a comparison could be made between transport policies in Australia, Canada and Brazil. Within Australia parallel studies could be undertaken of corporate planning in several state railway systems. At an urban scale there is the possibility of determining similarities and differences in freight transport activities in large cities. Within cities, attention could be directed to areas with traffic and environmental management schemes and those without and to assess community aspirations and support for such schemes. There is also the possibility of further work on disadvantaged groups at the household level (i.e. extending the work on housebound women, children, and the disabled). Transport in rural communities has not been on the research agenda whereas the urban areas have been extensively examined.

The detailed areas for future research - some of which have been indicated here - are matters for debate and refinement, and are, as Scrafton (1977) reminds us, a research project in itself. However, it is necessary to establish some principles. For simplicity of presentation, consider a simple model of society that includes a research sector and a policy sector, both drawn as monolithic blocks each containing the relevant actors (Figure 2). An identification of desirable research trends on the land-use, transport, environmental nexus for the year 2000 requires an understanding of the type of research as classified earlier in Table 7. In terms of practice, issues are time and place specific and subject to changes in federal and state transport policies so it is futile to speculate about the precise agenda for policy-oriented research that might hold in the year 2000. However, it is worth observing that training requirements, organisational changes, investment in equipment, cash flow requirements, personnel implications and legal liabilities of new approaches can make or break the acceptance of research findings and these aspects should be studied carefully as part of the research project. Nevertheless, determining what is achievable is probably the most difficult, albeit the most crucial, judgement in the entire research process. Policy-related research may fail to change practice because of limited understanding, organisational inertia, inflexible standards, mistrust of change and labour practices.

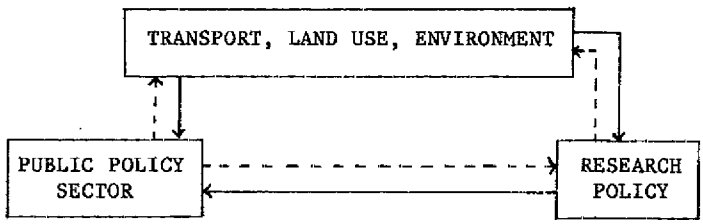

Figure 2: Interaction Between Government and Research Sectors Involved with Land use, Transport and the Environment (For further details, see Black, et al., 1983, pp. 94-97)

By its nature, theoretical and theoretical/practical research is fundamental and its potential for application is realised over longer time horizons than is the case of practical, policy-oriented research. The sort of research areas suggested in our prognosis are indicative examples only because the significant breakthroughs and contributions will emerge as a result of the individual abilities of researchers who will shape the year 2000 by their specific interests. Nevertheless, the appropriateness of approaches and techniques needs to be re-assessed continuously, if research is not to run the risk of being mis-spaced in time and mis-timed in place.

Applied research should be conducted with a clear understanding of who the potential users might be and their needs. The form of presenting the results and other material should be matched to the audience. A survey of transport agencies in the United States, for instance, recommended that the use of glossy paper magazines should be expanded whereas the use of technical report series could be reduced (Schmitt and Beimborn, 1982, p. 112) - Transport 2000: A Perth Study (Director General of Transport, 1982) is an excellent Australian example of what can be achieved in this respect. Other mechanisms aimed at enhancing the interaction between the researcher and user, such as videos and computer casettes and cartridges, should be developed and tested. This opportunity for two-way communication should assist in the dissemination of research results. Finally, the quality and user utility of written material should be improved, and this has implications for the future format of the Forum.

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References given in this paper to published Australian Transport Research Forum (ATRF) papers are stated in a consistent format: the number of the forum followed then by "ATRF: Forum Papers". The correct referencing should note the following changes in style over the years: Australian Transport Research Forum: Forum Paper, First Annual Meeting; Australian Transport Research Forum: (Second or Third or Fourth) Annual Meeting: Forum Papers; Fifth Australian Transport Research Forum: Forum Papers; (6th or 7th or 8th or 9th) Australian Transport Research Forum: Forum Papers.

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