

The Transport Information Partnership.

Judy Tickner,
Manager, Information Services,
Australian Road Research Board Ltd

Abstract:

Balancing the economic, environmental and social aspects of transport reform requires reliable data and an effective working partnership between the information users and the information providers. An active information service can reduce the cost of research by readily identifying related research and available data and facilitating access in a cost-effective way to the vast array of information sources available through the new technologies. Australia's transport libraries are rich in resources and a nationally co-ordinated transport information system would provide access for the research community to the local and overseas literature available within Australia as well as make a significant contribution to a national transport information strategy. The Australian Road Research Board provides a number of tools for the Australian research community. They include a bibliographic database (ROAD), databases on current research projects and an inventory of road-related datasets. These tools are dependent on the co-operative efforts of decision-makers, researchers and librarians. Beyond the library, access to the Internet and numerous transport, environment, economics and social science databases and information networks provides an enormous additional resource which can assist in addressing the trade-offs in transport proposals, projects and policies. The development of a national transport information strategy could ensure that the resources available are used more efficiently and that the information required is more widely accessible.

Contact Author:

J. Tickner
Australian Road Research Board Ltd.
500 Burwood Highway
VERMONT SOUTH VIC 3133

Telephone: (03) 881-1560
Fax: (03) 887-8104



1. INTRODUCTION

The objective of this paper is to provide an overview of the Australian transport information network and resources and to show how access can be gained to sources of information which can help to assess economic, social and environmental trade-offs in transport policy, projects and proposals.

In a time of rapidly changing information technology, it is essential for the information providers and the information users to be brought together - for librarians to take time out to listen to the current and anticipated information needs of those whose task it is to provide a safe, efficient transport system for us, and for researchers, not only to extend their knowledge of relevant information sources, but to provide input to the way Australia's information resources are managed.

In its report entitled *The Strategic Role of Academic Research* (ARC, 1994) the Australian Research Council refers to changes in the nature of research, with particular reference to the developments in communication providing increasing opportunities for international collaboration, noting also that some aspects of the environment appeared to be best studied with an international approach. There is also reference to the need for an interdisciplinary approach for many research questions. The Bureau of Transport and Communications Economics (1991) recognised the need also for a multi-disciplinary approach in the area of transport and the urban environment.

Value of research and information

The value of *research* to Australia has been well documented over the last few years and there has been growing recognition that research capability may be a strategic resource that can provide significant benefit to the economy (Melody, 1990). An economic evaluation of a major pavement research program supported by the Australian road authorities through the Australian Road Research Board Ltd (ARRB) and AUSTROADS centred on the Accelerated Load Facility (ALF). It found that there were benefits in terms of the reduction in road authority costs which reflected a direct 'hard dollars' return on the investment, as well as recognising other benefits which could not be readily quantified (BTA, 1992). An effectiveness audit of ARRB intersection capacity research assessed the benefits of the research from a number of approaches, including estimation and comparison of the monetary costs and benefits of the program. Conservative estimates of the benefits to Australian road users from application of the research products (in terms of delay and fuel savings) indicated a benefit/cost ratio of about 15 at a 6 per cent discount rate. The estimated benefits for fuel savings alone exceed the research costs. It is argued also that there are additional benefits in terms of environmental impacts and improved safety. These are just two examples of research projects resulting in clear economic benefits.

The value of *information* has been discussed in a number of contexts, from the allocation of \$3 billion over a 5 year period by the US government to provide access to information via the "Superhighway" (or tollway as some have called it) to the value of libraries and information services. The draft report of the ASTEC Working Party on

Research Data Networks (ASTECC, 1994) concluded that access to research networks is essential for research and higher education institutions and that they should be regarded as a strategic national asset and part of the 'price of admission' for undertaking world competitive research. While this conclusion is offered in the context of electronic data networks, it might also be applied to other forms of information networks.

In the strategic planning process for the future direction of transportation activities in the United States, significant deficiencies were found in the *data* needed to characterise the use and performance of the transportation system. This resulted in a study to provide an assessment of the data needed. Wigan (1994) highlights the same need for both data and information as an issue in developing transport policy in Australia.

Value of library and information services

Thawley (1992) points out that one of the major difficulties in discussing the value of library and information services is identifying the value of the 'resource' which libraries manage - information. The problem, however, is that

'the value of information unlike that of tangible resources, is simply not readily quantifiable. Information has no intrinsic value. Its value depends upon the context and its use by particular users on particular occasions, and the value of information to its user is impossible to determine in advance.'
(Eaton and Baldwin, 1991).

A number of studies have been undertaken on valuing library and information services. In 1990, ACLIS (Australian Council of Library and Information Services), CIRCIT (Centre for International Research on Communication and Information Technologies) and Telecom combined to fund an applied research project aimed at trialling methods which organisations could use to assist in identifying the value of their library-based information services. The report (Broadbent and Lofgren, 1991) presents results of the application of the priority and performance evaluation approach and a cost-benefit analysis within a Victorian government agency and a government business enterprise. These two evaluation techniques were based on the premise that, while the value of information services cannot be quantified in precise monetary terms, their benefits can be identified and estimated.

The major contribution of special library and information centres is identified as the saving of the time of professionals through the provision of information and documentation efficiently and effectively. With the nature of research now requiring a stronger international information base and, in the case of transport and the environment, a multi-disciplinary approach, the knowledge and skills of the information professional are even more important in the research process than ever before. They can also contribute to managing the costs which can be incurred in an organisation by end-users who generally do not have the necessary searching skills to conduct cost-effective searches. Savings are achievable by reducing labour costs of researchers and chargeable on-line time.

Performance assessment of library and information services is complex. Any evaluation must be measured against the objectives of the parent body and the contribution made by the service towards achieving those objectives. The measurement of the level of achievement is equally difficult, and may well require surveys of client satisfaction. What is clear is that there is no one set of indicators that can be applied to all libraries, or special libraries - each has its own specialised clientele with different priorities.

A large scale survey of over 2000 UK academics examined the importance for academic research of university and polytechnic libraries and how well these libraries met research needs (Erens, 1991). The survey also examined the researchers' perception of recent developments in library collections and services and the possible consequences for academic research of these developments - primarily reduced funding. There was evidence that needs were not being met by their libraries' collections, compared with 5 years' previously. There was greater dependence on inter-library loans and photocopies. While the British Library's Document Supply Centre has extensive resources and can meet most of the British needs, the situation is not the same in Australia. The National Library is not organised on a discipline basis and has traditionally paid greater attention to the social sciences and humanities. To come a little closer to home, if transport libraries are reduced or closed without regard for national resources, it is quite possible that material required for research may not be available within the country, and Australian material may not even be available abroad.

The role of the librarian has changed from custodian to one of information facilitator and manager, and depends completely on the information needs of the clients. Efforts are concentrated on providing access to relevant information delivered on time and managing information overload. Skills may be employed in a range of areas, from providing regular information updates on literature relating to the social impacts of roads for environmental impact assessments to obtaining market intelligence.

No-one will argue that the primary responsibility of each information manager is to the staff of his or her organisation. Historically, the nature of the librarians' business has been one of interdependence. One of the reasons so much material can be borrowed from other organisations is the great network that exists between information professionals. The network of inter-library loans officers in Australia is extensive. Sharing resources requires each party to contribute, and this means that if an organisation wants to make use of the resources of others it must also be willing to make its contribution. This should not be confined to lending items to other libraries, but to participate in schemes such as making the information resources of an organisation known to others - whether it is publications, data sets, research projects or in other forms. Unless Freedom of Information is an issue, the owner retains the right to refuse access, but on the other hand, someone might be willing to pay a healthy sum for your information.

Developments in technology and communications now provide access to world-wide resources, and have resulted in library services being only one component of the corporate information resource. Yesterday's library was little more than a repository.

Today, it is a gateway to a whole host of other resources, including databases, electronic bulletin boards, CD-ROMs, electronic journals, library catalogues around the world, and much more - on subjects more diverse than the environment, economics, sociology and transport.

2. ACCESS TO TRANSPORT INFORMATION IN AUSTRALIA

I would like to continue with a focus on the library and information resources available to the transport research community in Australia. This will include the libraries network, information services provided at ARRB, and a few other sources.

Libraries Network

The State road and traffic authorities and the Federal Department of Transport maintain working collections. ARRB's research library complements these holdings and makes over 3,000 documents available annually through the national inter-library loans system, over 1,000 of which are to other government departments. There is also valuable transport-related material within the libraries of a number of universities and other organisations such as the Royal Automobile Club of Victoria (RACV), the National Roads and Motorists' Association (NRMA) and the National Health and Medical Research Council (NH&MRC) Road Accident Research Unit. The Australian Bibliographic Network (ABN), provided by the National Library, records the holdings of the state libraries and the major university libraries. However, while some of the road authority libraries add their locations to existing records in ABN, items unique to transport libraries are rarely recorded. This means that in seeking a particular publication it may be necessary to contact one library after another - hardly a very efficient approach.

The ROAD database produced by ARRB provides access to a significant amount of Australian and overseas road literature and in contrast to the (ABN), includes journal articles, individual conference papers and many records with abstracts. ROAD represents ARRB's library catalogue from 1984, includes all ARRB conference papers and journal articles, has a wide coverage of Australian material since 1977, (including books, reports, conference papers, journal articles and items written by Australians and published abroad), and since 1988, relevant journal articles and conference papers from overseas publications received at ARRB. Following a meeting of Research Managers at ARRB in 1992, road authorities were urged to contribute their publications (or records of these) to ARRB to ensure their inclusion in ROAD. Appendix 1 shows the additions to date. ROAD now includes publications from Main Roads Western Australia and Tasmania Department of Transport and Works for all items which have electronic records. With the exception of Queensland and New South Wales, the gaps are due to the absence of electronic records in the library. There remains a portion of Australian publications held by the authorities and others, notably consultant reports, which, unless they are deposited in ARRB's Library are not recorded in ROAD. Following a recent agreement, the LASORS (Literature Analysis System on Road Safety) is also to be

included in ROAD, so that it will no longer be necessary for road safety researchers to search two separate files.

Until 1988, road authority libraries contributed information on some of their holdings to ROAD but due to resource constraints and changing systems and staff, this no longer occurs. The contributions not only enhanced the content of ROAD, but expanded the information on Australian research which ARRB processes for inclusion in the International Road Research Documentation Database (IRRD). IRRD is an initiative of the OECD and is provided as part of the Road Transport Programme. It is available by dial-up access on the European Space Agency Information Retrieval System (ESA-IRS) and will shortly be available on CD-ROM along with TRIS (US Transportation Research Board database) and TRANSDOC (transport economics information provided by the European Council of Ministers of Transport (ECMT)). Currently, only those Australian items in ARRB's Library are considered for inclusion in IRRD.

The National Library pays no particular attention to meeting the information needs of the transport community. It is therefore essential that special transport libraries and their owners take the initiative to participate in a national information system if the transport community is to achieve the efficiency benefits of a nationally co-ordinated transport information system. In its Strategic Plan 1993-98 (NLA, 1993), the National Library identified the following strategies to achieve its objectives in relation to national leadership and co-ordination:

- * work with and provide support for organisations with responsibilities for national collaboration in library and information services

- * form alliances and collaborate on special projects with individual institutions, where the achievement of mutual objectives will result in national benefits.

Preliminary discussions with the National Library's ABN Office and the Co-ordinator of the Distributed National Collection have confirmed their interest in the resources of the transport libraries as a significant collection.

At its meeting in 1993 TRANSLIB (Transport Librarians) initiated a consolidated list of periodical titles held by participating libraries. The list, compiled by ARRB's Information Officer, Lynne Beaumont, includes 2,200 journal titles, with 4,200 holdings from 18 libraries. (Contributing libraries are listed in Appendix 2). Consideration is being given to adding this list to ABN so that it can be accessed by a wide range of libraries. This is only one part of the total resources held by transport libraries. The addition of the remainder would require commitment by contributors, as well as technical and resource solutions.

TRANSLIB has also initiated a directory of libraries with transport collections. This is an alphabetical list by name of organisation, and includes addresses, names and contact numbers for key staff, subject coverage, special strengths or collections, access conditions, etc. The New South Wales Branch of the Chartered Institute of Transport generously contributed \$3,500 towards production costs for both of these projects.

I have dealt primarily with road-related information, as there is little information available on libraries dealing with other transport modes - except where State road authority collections have been amalgamated with others. The ROAD database does, however, include information on other modes where they are road-related (eg rail freight, level crossings) and also some material on airport pavements. The Department of Transport's ATLAS (Australian Transport Literature Information Service) database is an index to material on Australian transport economics such as transport policy and planning, airline deregulation and the road transport industry in Australia.

Information Services at ARRB

ARRB's mission is to assist in the solution of Australia's land transport problems. This is achieved through a national strategic research and technology transfer program. Information Services is part of the technology transfer program, supported and funded by AUSTRROADS, but recovering costs where possible.

As a national service, Information Services provides the following:

- * *ROAD* - the publications database, available on the local network at ARRB (updated daily), on INFORMIT's Engineering and Applied Science CD-ROM (updated twice each year) and on-line on the National Library's OZLINE (updated monthly).

- * *ROADLIT* - a fortnightly bulletin of new publications (including journal articles and conference papers) received in ARRB's library. ROADLIT has over 470 subscribers, including 50 from overseas. It is also circulated by many of these subscribers, so that the total readership is not known.

- * *Enquiry service* - responding to a range of enquiries from all sectors of the community. Enquiries which can be readily satisfied are free of charge and longer enquiries are handled on a fee-for-service basis. ARRB will also be acting as the Australian node in the PIARC INTERCHANGE project, providing a contact point for other countries to locate Australian expertise and for Australians to channel enquiries for contacts in other participating countries. The system will be based on AUSTRROADS contacts and ARRB's existing network and facilities.

- * *Literature searches* - ARRB has access to hundreds of files on DIALOG and ESA-IRS (European Space Agency Information Retrieval Service) and undertakes literature searches of both local and overseas files on a fee-for-service basis. In addition to transport sources, this provides access to information on economics, sociology and the environment in a number of different areas - air pollution, noise, chemistry, etc. IRRD does, however, cover these subject areas where they relate to road transport.

- * *Conference database* - lists forthcoming conferences in Australia and abroad; lists are included in *Road and Transport Research* (published quarterly by ARRB) as well as in ROADLIT.

* *ROADRES* is a database listing over 1500 Australian road-related research projects. It is compiled from input provided by State and Federal road and traffic authorities and other government departments, industry, consultants, universities and other research organisations. The 1994 survey has been extended to local government authorities with engineers. *ROADRES* includes updates to research projects reported in the *Compendium of Australian Research into Transport and the Urban Environment* (BTCE, 1991). 'Research' is interpreted broadly to include surveys, trials and tests. *ROADRES* is designed as a contact database, and is a valuable tool for minimising duplication and for notification of research in advance of publication. Subject access provides for the retrieval of special subsets for pavements, road safety, intelligent vehicle highway systems (IVHS) and environment research groups. It is accessible at ARRB and in each state road authority. Information is available at each road and traffic authority, on OZLINE, and on the CD-ROM. A sample record is shown in Appendix 3.

* *Inventory of data sets*

As an AUSTROADS project, ARRB has compiled an inventory of datasets relating to roads. It lists only datasets which are in electronic format, and includes inventories of roads, road characteristics and quality, asset registers for roads and bridges, road accidents, traffic volumes (passenger and freight), environmental datasets, registration and driver licensing and economic datasets. The list contains a broad summary of the data held including contact details and conditions of access.

Information Services also provides support to specialist organisations such as the National Road Transport Commission (NRTC) and IVHS Australia. A special IVHS subset of ROADLIT (IVHSLIT) is delivered electronically via Keylink to IVHS Australia Members. ARRB also has access to the IVHS America Clearinghouse and to the PATH database provided by the University of California at Berkeley, Institute of Transportation Studies.

The success of all of these services is heavily dependent on the input and co-operation of researchers, practitioners, managers and librarians. It requires notification of publications, current research, data sets, forthcoming conferences, a willingness to exchange information as well as communication of information needs. In its Enquiry into the Efficiency of Road Construction and Maintenance, the Standing Committee on Transport, Communications and Infrastructure (1993), stressed the importance of the exchange of research information between government and industry for the continued improvement in road construction and maintenance efficiency. It seems reasonable to assume that the value of this exchange is not confined to road construction and maintenance.

Other Australian Transport Information Sources

Statistics

Earlier this year the Australian Bureau of Statistics (ABS) released its *Directory of Transport Statistics* (ABS, 1994). The directory provides a guide to a range of reliable data that are available on various transport and related topics with examples of

the types of data available from the different sources as well as details about the sources themselves. It includes data from several sources besides the ABS.

In collaboration with the Victorian Standing Committee of Statistics, the ABS has also produced the Register of Victorian Government Data Collections and Databases, (ABS, 1992) providing access to information in other disciplines. ABS Victoria also published a *Register of Unpublished Data* (1988), complementing the Victorian component of the *Catalogue of Publications* (1993). The *ABS Catalogue of Electronic Products* (ABS, 1993) includes information on motor vehicle use, socio-economic indexes and census data.

Earlier this year AUSTROADS published *RoadFacts* (AUSTROADS, 1994), providing selected facts and figures relating to best practice, road use, the road system, environment, road safety, vehicles and drivers, travel and fuel, finances and state comparisons.

CouncilNet

CouncilNet is an electronic network set up to enhance local government communication on environmental information. It was established by the Centre for Resource and Environmental Studies at the Australian National University with funding from the Office of Local Government. It has e-mail as well as general and specific conference areas relating to waste, urban development, greenhouse, stormwater and drainage, water, environmental management and other topics. It has over 150 participants and is accessed through the Pegasus network.

Environment

The Environmental Resources Information Network (ERIN), established as a unit within the Commonwealth Department of the Environment, provides an environmental decision support system. It provides an infrastructure for agencies responsible for environmental resources planning, management and decision making and is based upon a sophisticated network of computers supporting environmental information systems with access to geographically related information. It enables the provision and integration of data from a wide base of disciplines including geography, ecology, geology and remote sensing. ERIN is contributing to the formulation of strategies for ecologically sustainable development and can provide information needed on natural resources to assist in assessing the trade-offs between environmental factors and transport projects. For example, the decision on whether another runway should be built at Sydney airport was a complicated political and environmental decision. Not only were there concerns about noise pollution, but Botany Bay is a rich and environmentally sensitive fishing area. A 4.5 kilometre-long underwater geotextile silt curtain was constructed to protect the waters of the adjacent bay from sediment-filled water from dredge discharge during construction, lessening the impact on seagrass and fish communities. More than 100 species of birds also visit the area each year and an alternative site had to be found which was suited to the birds displaced by the construction.

ERIN also provides a directory of data sets available on the network and is connected to the Australian Academic and Research Network (AARNET).

3. UPDATE ON OTHER INFORMATION SOURCES OF INTEREST TO TRANSPORT RESEARCHERS

Developments in communications and information technologies have contributed significantly to the value of information in society and the economy, and access to the Internet has provided a wealth of information previously available only to a small group. Databases on-line and on CD-ROM, bulletin boards and electronic periodicals provide access to global literature and other resources including economics, environment, sociology and transport.

Transport

Reference was made earlier to the major literature transport databases. IRRD, TRIS and TRANSDOC are currently available on-line and will be on CD-ROM before the end of this year.

COMPENDEX and NTIS (National Technical Information Service) can also support transport research through their general engineering and technology content. COMPENDEX, available on-line and on disc, provides abstracted information from the world's significant literature on engineering and technology. It covers 4,500 journals and selected government reports and books, and includes literature from civil, environmental, geological and automotive engineering. The NTIS database provides access to the results of US. government-sponsored research, development, and engineering, plus analyses prepared by Federal agencies, their contractors, or grantees. It is the means through which unclassified, publicly available, unlimited distribution reports are made available for sale from agencies such as NASA, the Department of Environment, the Department of Transportation and some 600 other agencies. Some US State and local government agencies also contribute their reports to the database. NTIS also provides access to the results of government sponsored research and development from countries outside the US. (eg. the French National Centre for Scientific Research)

Numerous bulletin boards are springing up but need to be carefully evaluated if they are to be used efficiently. A research project that evaluated the performance of five transportation-related electronic bulletin board systems operated by the US. FHWA's Local Technical Assistance Program (LTAP) technology transfer centres concluded that the success of electronic bulletin boards as a mechanism for technology transfer depends on the computer fluency of potential users, system maintenance and reliability, the cost of access, and the quality of products and marketing (Adams et al, 1993).

While there are over 3,000 full-text sources on DIALOG alone, there are no major transport research journals listed. *Inside IVHS* is one of the newsletters available full-text.

Economics

Databases providing access to economics literature are numerous and well established and there are several economics journals available full-text. However, a search on transportation in the economics literature found little of relevance to transport research outside the industry and business context. This suggests that while the economics databases such as the Economic Literature Index on DIALOG should be consulted for economic theory, the transport economics literature is most likely to be retrieved in the transport files. According to an OECD report (OECD, 1993), economic information is growing more rapidly than scientific and technical information.

Environment

Literature relating to the environment is increasing rapidly, as are the access points. Alston (1993) provides an excellent update on access to environmental information, building on a previous review of online environmental information resources and the scientific and technical aspects of online environmental information. The update covers information sources on the Internet, bulletin boards, online databases, databases on diskette and CD-ROMs.

Existing on-line systems are expanding their linkages to each other and the environmental information they have available. The Online Library System of the US Environmental Protection Agency (EPA) is now accessible via the Internet and a list of environmental resources on the Internet is available from the US EPA Office of Pollution Prevention and Toxics Library.

Electronic bulletin boards are another environmental information resource available from many different organisations, including Departments of the US Federal government. The Pollution Information Exchange System (PIES) bulletin board has established an Environmental Librarians Exchange.

The number of on-line databases with environmental information is also increasing. Data from the US Department of Transportation, the EPA and the National Response Center have been gathered in the Emergency Response Notification System (ERNS), offering information on reports of releases of oil and hazardous substances. *Enviroline* on DIALOG is a comprehensive environmental database that covers everything from air pollution and alternative energy sources to waste management and wildlife habitat, providing access to over 800 journals as well as conference proceedings.

4. CONCLUSIONS

A number of changes are affecting the way we work and the need for information - changes in technology and communications, the nature of research, economic climates, community attitudes and expectations, etc. The convergence of information and communications technologies has provided access to a greater range of information than ever before, offering a challenge for both researchers and information professionals.

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Australia has a library infrastructure to which the transport libraries can make a significant contribution, thus making maximum use of available resources. We need to improve and share our knowledge of and access to published, unpublished and electronic information and data sources and communicate this information effectively. Support and commitment by the research community, management and information professionals to a nationally co-ordinated transport information system could provide an effective information partnership.

I would like to suggest that the information users and the information managers from this first joint forum consider the development of a national transport information strategy, identifying strengths, weaknesses and gaps in both information and data, addressing improved sharing of knowledge and resources (published, unpublished and electronic), and improved access to bibliographic records of all Australian transport literature.

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APPENDICES

Appendix 1

ADDITIONS TO ROAD DATABASE, 1994.

All records available in electronic form from:

Main Roads Western Australia
Tasmania Department of Transport and Works

Publications of:

| | |
|-----------------|--|
| South Australia | Department of Road Transport Office of Economic Planning and Policy |
| Queensland | Department of Transport (1990 onwards) |
| Victoria | VicRoads (own publications for which electronic records are available) |

Appendix 2.

**LIBRARIES CONTRIBUTING TO TRANSLIB UNION LIST OF
PERIODICALS**

- NSW Roads and Traffic Authority of NSW
Cement and Concrete Association of Australia
Maritime Services Board (NSW)
NRMA
University of Sydney Graduate School of Business
- WA Main Roads Western Australia
Western Australia Department of Transport
- VIC Australian Road Research Board Ltd
RACV
VicRoads
- SA NH&MRC Road Accident Research Unit
South Australia Road Transport Agency
South Australia Office of Transport Policy & Planning
- QLD Queensland Transport
- TAS Tasmanian State Offices
- NT Northern Territory Department of Transport & Works
- ACT Department of Transport (Federal)
ACT Government Services
- NEW ZEALAND
New Zealand Land Transport Safety Authority

Appendix 3

SAMPLE RECORD FROM ROADRES (Road Research Projects)

LIST OF

RC 9401AR017E
 TI Spatial Information Systems for road infrastructure planning and evaluation
 IN Black=JA
 Trinder=JC
 Ton=TT
 Vandebona=U
 TEL (02) 697 5018
 FAX (02) 663 2188
 ORG University of New South Wales. Department of Transport Engineering
 AD PO Box 1 Kensington NEW SOUTH WALES
 PC 2033
 SDO 1993
 EDO 1995
 ST ACTIVE
 SUM The overall aim of this research is to integrate existing technologies of land information systems, land use/transport/environmental modelling and geographical systems; to study the current role of GIS in road and traffic authorities; to build a prototype system for demonstrating feasibility.
 PUB Geographical Information Systems and land-use/transport interaction models:towards system integration, In; Land Management and Geographical Information Systems Conference, 1993, Sydney, New South Wales, Australia
 AU: Ton=TT;Black=JA DOC DATA: 1, p263-276. DATE: 1993.
 DE Research and development
 Geographic information system (GIS)
 Environment
 Land use
 Transport planning
 Prototype
 DI 1994-02