



Planning and Transport Research Centre

ANNUAL REVIEW 2006



Department for Planning
and Infrastructure



The Planning and Transport Research Centre (PATREC) is a collaboration between the four public universities of Western Australia, Curtin University of Technology, Edith Cowan University, Murdoch University and The University of Western Australia. It also receives financial support from the Government of Western Australia (through the Department for Planning and Infrastructure and Main Roads Western Australia).



PATREC now well established ...

2006 was PATREC's third full year of operation and its programs are becoming well established.

Research directions and a strong research program are now in place, resourced with generous support from many research partners. The challenge for the future will be to continue building the scope and strength of this research program, across all our collaborating universities.

Building research capacity is a key objective for PATREC, and in this regard it is gratifying to see a continued strengthening of our PhD program. A number of students in the Master of Transport Studies program are also close to completing their coursework and commencing their major research projects.

The strongest areas of research focus are now urban public transport planning and the relationship between infrastructure and urban planning; freight infrastructure economics, with a focus on the impacts of economic policy; transport safety; and advanced modelling for transport and urban planning and design.

During 2006, almost \$800,000 in research revenue was payable to collaborating universities for research projects in these fields.

Dissemination of research initiated by PATREC and/or conducted by PATREC affiliates occurred in publications and research forums during the year, including the Australasian Transport Research Forum (ATRF), the Conference of Australian Institutes of Transport Research (CAITR) and a number of overseas conferences. Also important in this regard were PATREC's second annual Research Forum and several targeted PATREC conferences and seminars.

The collaborative Master of Transport Studies has been developed further during the year, with approval given by collaborating universities to offer articulated Graduate Certificate and Graduate Diploma courses. By the end of the year, processes to obtain approval to offer the MTS and GradDipTS to international on-shore students had also been brought close to completion.

Once again I would like to thank my colleagues on the Board of PATREC and the Centre's management team for their individual contributions to an excellent year. In particular I gratefully acknowledge the tireless leadership and direction provided by PATREC's Executive Director, Professor Fred Affleck.

Stuart Hicks AO

Chairman
Planning and Transport Research Centre

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PATREC's Role in Planning and Transport

The purpose of PATREC is to help increase capacity in Western Australia to undertake informed planning and policy development in the related fields of land use planning and transport. PATREC has created a network to promote collaboration between academic research people and teachers who share skills, knowledge and (where appropriate) intellectual property with each other and with industry partners. Where there are shared interests we also work closely with academic researchers in other universities.

'Planning' and 'transport' span very diverse academic fields, but they are linked through a broad commonality of policy concerns and a skill base with many shared elements. There is potential interaction for policy and planning between transport infrastructure, land use and regional development planning, travel behaviour, sustainability, freight logistics, the economics of transport policy and regulation, and management of safety risks. The broad web of knowledge, skills and policy interests in these fields also provides the basic structure for PATREC's Master's degree course and for collaboration on many research projects.

Virtually all PATREC post-graduate students and post-graduate and post-doctoral research fellows conduct their studies within faculties or research institutes located within one of our four founding sponsor universities. Often they work in partnership with industry sponsors. All are affiliated with PATREC for funding, capacity building and research collaboration. PATREC itself does not provide facilities for research work to occur. The principal objective of PATREC's Board and management is to foster and support collaboration and capacity building.

Structure and governance

The Planning and Transport Research Centre is an unincorporated entity established by a Memorandum of Understanding between Western Australia's four public universities: Curtin University of Technology, Edith Cowan University, Murdoch University and The University of Western Australia. It receives financial support from these institutions and from the Government of Western Australia.

PATREC is a formal collaboration between the four universities with the stated purposes of offering a professional Masters Degree in Transport Studies and conducting a research program supported by industry and government funding and national competitive grants. PATREC's education program is conducted by its four collaborating universities, who are also responsible for conducting all research arranged on their behalf by PATREC. All research grant monies are paid directly to one or more of these universities. Where appropriate PATREC arranges alliances with other research centres in Western Australia, elsewhere in Australia and overseas. PATREC operates from offices located at Curtin University of Technology in Perth, Western Australia.

PATREC is governed by a Board representing its sponsoring universities and the Government of Western Australia that meets three times each year. The Centre is managed by the Executive Director, who occupies the Chair of Transport Studies in Curtin University of Technology, and holds separate appointments as Adjunct Professor at each of the other collaborating universities.

The Memorandum of Understanding establishing PATREC will expire near the end of 2007 unless extended or replaced. During 2006 the PATREC Board initiated a Review of the Centre to provide a basis for assessing whether the Centre's collaborating universities should seek to continue PATREC for a further term of up to five years.

PATREC's Board

At 31 December 2006 PATREC's Board comprised the following members:

Adj Prof Stuart Hicks AO	Independent Chairman
Prof Jane den Hollander	Representing Curtin University of Technology
Prof Robert Harvey	Representing Edith Cowan University
Prof Andris Stelbovics	Representing Murdoch University
Prof Doug McEachern	Representing The University of Western Australia
Mr Greg Martin	Representing the Government of Western Australia

Adjunct Professor Stuart Hicks AO, BEc, FAIM, FCILT, FAICD, MIMC is also Chairman of the East Perth Redevelopment Authority and Chairman of the John Curtin Institute for Public Policy at Curtin University of Technology. He is a former Chairman of the National Transport Commission and former Director General of Transport in Western Australia. Stuart holds separate appointments as Adjunct Professor at Curtin University of Technology, Edith Cowan University, Murdoch University and The University of Western Australia.

Professor Jane den Hollander BSc(Hons), MSc, DPhil is Deputy Vice Chancellor, Academic Services at Curtin University of Technology.

Professor Robert Harvey BEc (Hons), MBA is Executive Dean in the Faculty of Business and Law and Pro Vice Chancellor, Equity & Indigenous at Edith Cowan University.

Professor Andris Stelbovics BSc (Hons), PhD, FAIP is Deputy Vice-Chancellor Research at Murdoch University.

Professor Doug McEachern BA(Hons), MA, PhD is Deputy Vice-Chancellor, Research and Innovation at The University of Western Australia.

Mr Greg Martin BEng (Hons), BCom, MS, Grad Dip (Urban Systems), FIE (Aust), FAIPM, FCILT, FAIM, MAICD, MPMI is Director-General of WA's Department for Planning and Infrastructure.



The PATREC Board and Principal Officers

L-R (front): Prof Robert Harvey, Stuart Hicks AO, Prof Jane den Hollander; L-R (rear): Andrew McLean (Business Manager), Prof Doug McEachern, Greg Martin, Prof Andris Stelbovics, Prof Fred Affleck (Executive Director).

Academic Advisory Board

The Memorandum of Understanding between PATREC's participating universities establishing the collaborative Master of Transport Studies degree requires the establishment of an Academic Advisory Board.

The Academic Advisory Board comprises the Executive Director of PATREC, and one member appointed by each university. Its function is to advise the Executive Director and the universities on academic matters, including student admissions, awarding of degrees and selection of scholarships awardees and prizes. It meets as required, generally 4-5 times in each academic year. The members of the Academic Advisory Committee are the PATREC Executive Director (chairman) and representatives of the four collaborating universities:

Assoc Prof Carey Curtis BSc (Hons) Geog (*Middlesex Polytechnic*); MSc Rural Planning (*Reading*); PhD (*Curtin*), DipTP Urban Planning (*Oxford Polytechnic*); Certificate of Teaching in Higher Education (*SEDA UK*), Associate Professor in the School of Urban and Regional Planning, Faculty of Built Environment and Design, Curtin University of Technology. Dr Curtis is a member of the Western Australian Planning Commission.

Adj Fellow John Georgiades BSc (*UWA*), BEc (*UWA*), Diploma in Computing (Postgrad)(*UWA*), Adjunct Research and Teaching Fellow, School of Management, Faculty of Business and Public Management, Edith Cowan University. John is also Advisor Freight and Logistics in the Department for Planning and Infrastructure.

Prof Jeffrey Kenworthy BSc (Hons) (*Murdoch*), PhD (*Murdoch*), Institute of Sustainability and Technology Policy, Murdoch University. Dr Kenworthy is a member of a number of public advisory committees, including the Public Transport Authority's Customer Advisory Council (Urban Rail), the Walking WA Committee of the Department for Planning and Infrastructure and the Western Australian Land Information System Advisory Committee.

Prof John Taplin AM, PhD (*Cornell*), MAgEc (*New England*), BA (Economics and Philosophy)(*New England*), School of Economics and Commerce, The University of Western Australia Business School. Prof Taplin is Adjunct Professor at Tongji University (Shanghai) and is a former Director General of Transport in WA.

PATREC's Management Team

During 2006 PATREC was managed by a full time team of two, the Executive Director and the Business Manager plus a part-time Administrative Assistant. Curtin University of Technology provided office accommodation and services.

Professor Fred Affleck BA(Hons)(*BritCol*), PhD (*London*), FAICD, FCILT is Executive Director of the Planning and Transport Research Centre. Dr Affleck has worked in several areas of transport – rail, port access, roads and road transport, urban public transport and aviation. He has held government, management and consulting roles in Australia and Canada since 1969, among these as Advisor to the Commonwealth Grants Commission on railways and public transport (1978-1985) and General Manager Corporate Affairs in the National Rail Corporation Ltd (1992-2000). Dr Affleck is also Chairman of the Western Australia's Midland Redevelopment Authority and a member of the Australia's National Transport Commission.

Andrew McLean BA(Hons)(*Curtin*) is PATREC's Business Manager and the Board's Executive Officer. Andrew is the main contact for all matters connected with PATREC's education program, financial and research management. He commenced with Curtin University of Technology in 1993 and has extensive experience in university administration.

Funding

PATREC is supported by subscription income from Western Australia’s four public universities and Western Australia’s Departments for Planning and Infrastructure and Main Roads. In 2006 the six ‘founding sponsors’ contributed annual subscriptions totalling \$362,500 made up as follows:

Curtin University of Technology	\$62,500
Department for Planning and Infrastructure	\$100,000
Edith Cowan University	\$15,000
Main Roads WA	\$60,000
Murdoch University	\$62,500
The University of Western Australia	\$62,500

This income is supplemented by minor income from research funding and from interest on account balances held by Curtin University of Technology on behalf of all sponsors. The total income available to PATREC in 2006 to meet expenses incurred for salaries, administration, scholarships, prizes and related expenses was \$425,750.

Academic and Research Staff/Students

Researchers affiliated with PATREC are of several kinds: Full-time academic staff who combine teaching and research at our sponsor universities; full-time academic staff who devote all their time to research, generally attached to a specialised research institute at a sponsor university; full-time or part-time academic staff who supervise students affiliated with PATREC; academic research professionals who undertake research for a variety of projects initiated by PATREC; postgraduate students affiliated with PATREC; and part-time ‘adjunct’ academics in the universities undertaking research whose appointments are based on industry or other experience and expertise.

Each member of academic staff who will be teaching units in the Master of Transport Studies, supervising post-graduate research and/or contributing to the Centre’s research program is employed by one of the four sponsoring universities. From time to time others from outside the universities are invited to participate in teaching and research activities, in order to widen the resource pool available.

All who were active collaborators in PATREC during 2006 are listed below.

Les Chandra	Research Associate, Institute for Sustainability and Technology Policy	Murdoch University
Dr Elizabeth Chang	Professor of Information Systems	Curtin Business School
Dr Trudi Cooper	Lecturer, School of Community Services, Education and Social Sciences	Edith Cowan University
Dr Carey Curtis	Assoc Professor of Urban and Regional Planning	Curtin University of Technology
Dr Mike Dockery	Research Associate, Economics and Finance and Director, Centre for Labour Market Research	Curtin Business School
Dr Angela Durey	Graduate Research Assistant, School of Community Services, Ed’n & Social Sciences	Edith Cowan University
Dr Judith Finn	Professor, School of Population Health	The University of Western Australia
John Georgiades	Adjunct Associate Lecturer, Faculty of Business and Law	Edith Cowan University and Curtin University of Technology
Izumi Hart	PhD candidate, School of Psychology	Murdoch University

Dr Paul Cozens	Research and Teaching Fellow, Department of Urban and Regional Planning	Curtin University of Technology
Dr Laurence Hartley	Assoc Professor of Psychology	Murdoch University
Dr Trevor Heaver	Visiting Research Fellow	Professor Emeritus, University of British Columbia
Delia Hendrie	Lecturer, School of Population Health	The University of Western Australia
Carlindi Holling	Research Associate, Housing and Urban Research Institute of WA	Curtin University of Technology City of Perth
Farookh Khadeer Hussain	PhD candidate, Centre of Extended Enterprises and Business Intelligence	Curtin Business School
Wen Huang	Research Associate, Information Management and Transport, UWA Business School	The University of Western Australia
Dr Jeffrey Kenworthy	Professor in Sustainable Cities, Institute for Sustainability and Technology Policy	Murdoch University
Ian Ker	Adjunct Assoc Professor	Curtin University of Technology
Dr Peter Lawrence	Adjunct Associate Professor	Edith Cowan University and Curtin University of Technology
Dr Andy Lee	Professor of Bio Statistics, School of Public Health	Curtin University of Technology
Dr Terry Love	Research Fellow, Department of Design	Curtin University of Technology
Anusha Mahendran	Research Associate, Centre for Labour Market Research	Curtin Business School
Dr Fiona Haslam McKenzie	Professor, Faculty of Built Environment, Art and Design; Acting Executive Director, John Curtin Institute of Public Policy; and Director, Housing and Urban Research Institute of WA	Curtin University of Technology
Roger Mellor	Research Associate, Department of Urban and Regional Planning	Curtin University of Technology
Dr Lynn Meuleners	Senior Research Fellow (Road Safety), School of Public Health	Curtin University of Technology
Dr Peter Newman	Professor of City Planning and Sustainability	Murdoch University
Dr Doina Olaru	Lecturer, Information Management and Transport, UWA Business School	The University of Western Australia
Peter Palamara	Research Associate (Road Safety), School of Public Health	Curtin University of Technology
Dr Terri Pikora	DPI Research Fellow in Marine Safety, Injury Research Centre	The University of Western Australia
Dr Vidyasagar Potdar	Research Fellow, Centre of Extended Enterprises and Business Intelligence	Curtin Business School
Dr Min Qiu	Senior Lecturer, Information Management and Transport, UWA Business School	The University of Western Australia
Dr John Renne	Visiting Research Fellow	Assistant Professor, University of New Orleans
Emmerson Richardson	Adjunct Assoc Professor	Curtin University of Technology
Sharif Siddique	PhD candidate, Information Management and Transport, UWA Business School	The University of Western Australia
Brett Smith	Lecturer and PhD Candidate, Information Management and Marketing, UWA Business School	The University of Western Australia

Dr John Taplin AM	Professor of Information Management and Transport, UWA Business School	The University of Western Australia
Dr Malcolm Tull	Assoc Professor of Economics	Murdoch University
Dr Martin West	Deputy Head of School, Information Systems	Curtin Business School
Nick Wills-Johnson	ARG Research Fellow in Railway Competition Policy	Curtin University of Technology

Professional Education

PATREC offers a Master of Transport Studies (MTS) degree for full or part-time study. Students may be admitted to study through any of our four sponsoring universities and units of study are delivered by all of them. Taken full time the duration of the degree program is eighteen months. From 2006 a selection of units in the degree has also been available for extension (not-for-degree) study.

From 2007 PATREC will also offer a Graduate Certificate (GCertTS) and Graduate Diploma (GDipTS) as both entry and exit (intermediate) qualifications articulating to the Master of Transport Studies degree.

Master of Transport Studies

A collaborative professional Masters degree (by coursework), the Master of Transport Studies, is offered through PATREC for full-time or part-time study. During 2006, twelve students were enrolled for the MTS degree. Information on the MTS is available at www.patrec.org/studies/course_detail.php?id=1.

The 'collaborative' degree program is 18 months' duration full time (up to 5 years part-time) and is offered jointly by our four participating universities. Students successfully completing the course will be awarded the degree by the university where they formally enrol, but the participation of the other three universities will be acknowledged on the degree testamur.

The degree program requires students receiving the Masters degree to have completed eight units of coursework and a major research assignment. There are five mandatory 'core' units of study:

- Cities and Sustainability (Murdoch University)
- Planning for Accessibility (Curtin University)
- Transport Assessment and Evaluation (Edith Cowan University)
- Transport Systems and Policy (University of Western Australia)
- Research methods (to be taken at the university where the student enrolls).

Students are also required to complete three 'elective' units chosen from the following options (other electives are available for substitution):

- Integrated Plan Making (Curtin University)
- Advanced Transport Modelling (University of Western Australia)
- Transport Safety (University of Western Australia)
- Risk Management (Murdoch University)
- Logistics and Supply Chain Management (University of Western Australia)
- Global Distribution and Transportation (Curtin University)
- Principles of Enterprise Logistics Management (Curtin University)
- Project Management (Murdoch University)
- Business Strategy (Edith Cowan University)

Managing Change (Edith Cowan University)

One semester (or its equivalent) must be devoted to a significant supervised research project undertaken at each student's enrolling university.

During 2006 there were ten active students in the Master of Transport Studies program. At the time of writing there were three new enrolments in the degree program and one enrolment in the GradDipTS. Students enrolled in the MTS on a for-credit basis in 2006 are shown below.

Degree Candidate	Enrolling University	Scholarships / Prizes
David Browne DipGov (Mgt), AdvDip(Pers & Ops Mgt)	The University of Western Australia	
Dean Davidson BA, PGradDipUrbRegPlan, MA, DipMgmt	The University of Western Australia	Core unit prize 2005
Johan Gildenhuis BSc (Hons), MURP, PostGradDip EIA	Edith Cowan University	Core unit prize 2006
Michael Kennedy BEc, MBA	Curtin University of Technology	PATREC Scholarship
Hayley Lajszczak BBus/BComm, Grad Cert (Applied Finance & Investment)	Curtin University of Technology	Core unit prize 2006
Nigel Matthew BComm, BEc	The University of Western Australia	PATREC Scholarship Core unit prize 2005
Michael Priest AssocDipEng (Civil)	The University of Western Australia	
Lara Sweet BEng (Civil), MEIAust, CPEng	The University of Western Australia	PATREC Scholarship Core unit prize 2006 (3)
Owen Thomas BA(URP)	The University of Western Australia	
Michael Vujcich BEng (Civil)	The University of Western Australia	

Short Courses

In 2006 PATREC again offered professional development short courses as part of our *Planning and Transport Modelling Program* (see **Appendix A** for an overview of this program). Participants from organisations sponsoring the Planning and Transport Modelling Program were be registered free of charge. Two short courses were offered:

Transport Planning with STEM: Perth's 'Strategic Transport Evaluation Model': a 1½-day short course presented in November and December 2006 by Adjunct Associate Professor Peter Lawrence.

An Introduction to Transport Modelling: A three-day short course presented in January and July 2006 by Dr Min Qiu (Senior Lecturer) and Dr Doina Olaru (Lecturer) in the School of Economics and Commerce (UWA Business School).

Further short courses for professional development are planned for 2007, including a six-day Introduction to Traffic Engineering in February and July 2007. Further information on PATREC short courses is available at www.patrec.org/courses/index.php.

Conferences and Seminars

During 2006 PATREC organised three events to provide opportunities for academic researchers, students, industry and the general public to gain knowledge about research being conducted by PATREC and other affiliated organisations. These were:

The **Second Annual PATREC Research Forum** (19 September 2006): Ten refereed papers were presented at this second annual Forum (at the University of Western Australia Club). The Governor of Western Australia, His Excellency Dr Ken Michael AC was the guest of honour at a reception attended by over 100 PATREC affiliates and guests. Papers presented at the seminar and other related materials are available at www.patrec.org/conferences/PATRECForum_Sep2006/index.php.

Symposium on Rail Competition Policy (17 October 2006): This important symposium was held at the Curtin Graduate School of Business, and attracted national participation. Papers and other related materials are available at www.patrec.org/conferences/PATREC_Rail_Symposium_Oct2006/index.php.

The **Youth Rail Seminar** (24 November 2006): This seminar at the Mount Lawley campus of Edith Cowan University (ECU) was held to disseminate the outcomes from PATREC's Youth Rail research project, conducted by a team from ECU and Curtin University of Technology. Seminar papers and other related materials are available at www.patrec.org/conferences/PATREC_Youth_Rail_Seminar_Nov2006/index.php.

During 2006, PATREC continued to provide other opportunities for students and other program affiliates to interact with each other and with other PATREC stakeholders. These included four breakfast meetings addressed by guest speakers and the weekly *Curtin Corner* (jointly sponsored with the John Curtin Institute of Public Policy) which provides informal opportunities for policy based discussion.

PATREC's Research Program

PATREC has four areas of research concentration: freight logistics, integrated land use and transport planning and policy, land use/transport modelling and transport safety and security. Research projects are carried out for public and private sector partners in transport and urban and regional development. Research funding may be sourced from these industry partners and/or from national competitive research grants, including the Australian Research Council (ARC) Linkage and Discovery programs, Cooperative Research Centres (CRCs) and the Western Australian Centres of Excellence program.

Significant partnerships may also be formed for research programs lasting two or more years, some of which support long-term research fellowships. These currently exist for research in the areas of marine safety, railway competition policy, integrated transport and land use modelling, and transit oriented development.

The Centre has formal and informal partnerships with other research bodies, with which we collaborate on research projects, e.g. the CRC for Rail Technology, the CRC for Sustainable Forest Landscapes, the Western Australian Housing and Urban Research Institute, the Centre for Labour Market Research, the Murdoch Research Institute for Sustainable Energy and the Institute for Sustainability and Technology Policy.

Research staff affiliated with PATREC also undertake occasional consulting, but our primary emphasis is on academic research.

Research outcomes, in the form of reports, working papers, conference papers and published articles and monographs will generally available on PATREC's website.

Post-doctoral and post-graduate research fellowships

During 2006 three research fellows conducted research through arrangements made by PATREC:

Dr Terri Pikora PhD (UWA), MPH (UWA), BHSc (Health Promotion)(ECU), AssDipAppSc (Library Media)(ECU). Dr Pikora was Marine Safety Research Fellow employed by the University of Western Australia in the Injury Research Centre (School of Population Health). This fellowship is fully funded by the Department for Planning and Infrastructure to support its marine safety programs. The substantial program of research led by Dr Pikora produced several publications during 2005 and 2006.

Dr John L. Renne PhD (Rutgers), MURP (Colorado), BEnvDes (Colorado) AICP, is Assistant Professor of Urban Planning and Transportation Studies, Associate Director of the University of New Orleans Transportation Center, School of Urban Planning and Regional Studies, University of New Orleans. During 2006, John Renne continued his association with Murdoch University and PATREC by involvement in a research project to define performance criteria for Transit Oriented Development precincts in Perth.

Nick Wills-Johnson BEc(Hons)(UWA) is Research Fellow investigating the impact on railway infrastructure investment of national competition policy, including third party track access and vertical separation. This fellowship is fully funded by the Australian Railroad Group Ltd. Nick was appointed to this position at Curtin University of Technology in April 2005 and will complete his research in 2007. Nick is completing a PhD examining the impact of antitrust regulation in Australia.

Doctoral studies

During 2006 ten students were conducting doctoral research in association with PATREC. Three of these students submitted their theses during the year.

Degree Candidate	Research Topic / Degree	University / School	Scholarships / Prizes
Zeenat Abdoolakhan LScEc (Paris), MScEc (Paris)	Supply Conditions & their Bearing on the Adoption of Alternative Fuel Vehicles & Hybrid Electric Vehicles PhD candidate	Information and Transport, School of Economics and Commerce, UWA Business School	University Postgraduate Award; PATREC top-up scholarship; C.Y. O'Connor Prize (PATREC Research Forum 2006)
Dean Davidson BA, PGradDipUrbRegPlan, MA, DipMgmt,	Intermodal planning: optimal location of container yards PhD Candidate		Master of Transport Studies core unit prize 2005
Brett Smith BAEd (Mathematics)(ECU), GradDip (Mathematics)(ECU)	Extension of the relationship between the choice modelling paradigm and neo-classical demand theory in a travel behaviour context PhD candidate		
Sharif Siddique BSc (Eng) (B'desh), MBA (Dhaka), MInfoMgt (W.Aust)	Development of policies to ameliorate the environmental impacts of cars in Perth City, using the results of a state preference survey and air pollution monitoring PhD submitted 2006		PATREC Scholarship
Yu Chao Sun BArch (SW Jiao Tong), GradDipEComm (Murdoch), MInfoMgt (W.Aust)	A genetic algorithm for urban layout design and optimisation PhD Candidate		The Village at Wellard Scholarship (awarded in conjunction with an APAI - ARC Linkage)

Clare Yu BEng (Qingdao), GradDipComp (Curtin), PGradDipCompSc (Curtin), MSc (Curtin)	Integration of economic, environmental social factors into formulating and prioritising transport policies PhD Candidate		PATREC Scholarship
Lixi Zhang BEng (Chengdu), MInfoTech (Wollongong), MCompStud (Wollongong), MInfoSys (Wollongong)	Vehicle Routing in Logistics: Genetic Algorithms for Stochastic Vehicle Routing Problem with Simultaneous Delivery and Pick-up PhD Candidate		University Postgraduate Award
Wen Huang B Eng (Tong Ji - Shanghai)	Estimate of freight trip matrix for the Perth metropolitan area MEng candidate (Tong Ji University)		Most outstanding student in graduating class.
Izumi Hart BA, GradDipPsych, BSc(Hons)(Macquarie)	Benchmarking Safety Culture in the Australian Rail Industry PhD candidate	School of Psychology, Murdoch University	Murdoch University Scholarship; industry top-up support; C.Y. O'Connor Prize (PATREC Research Forum 2005)
Farookh Khadeer Hussain BTech (CS&CE)(Jawaharlal Nehru Technological University), MIT (LaTrobe)	A methodology for establishing trust in logistics peer-to-peer environments PhD (<i>submitted 2006</i>)	Centre of Extended Enterprises and Business Intelligence, Curtin Business School	Curtin University Scholarship; PATREC top-up scholarship.
Vidyasagar Potdar BSc (Gujarat), MIT (Newcastle).	Information hiding through digital watermarking and steganography and its applications to the supply chain industry PhD (<i>awarded 2006</i>)		PATREC Scholarship
John Smoker BA(Design)(Curtin), JP	Remote indigenous community road management and sustainability M Phil candidate	Institute for Sustainability & Technology Policy, Murdoch University	PATREC Scholarship

Collaborating research organisations

PATREC facilitates research by initiating research projects with government and industry partners and by means of national competitive grants. Research projects are then conducted by academic staff in one or more of the four sponsoring universities, often in collaboration across institutions. A key role for PATREC therefore is to identify appropriate centres of research excellence that can become affiliated with its research program.

Research collaborators affiliated with PATREC during 2006 are shown in the Table below.

PATREC research collaborators 2006
Centre for Extended Enterprise and Business Intelligence, Curtin University of Technology
Centre for Labour Market Research, Curtin University of Technology
Centre for Transportation Studies, University of British Columbia
Cooperative Research Centre in Railway Technology, Central Queensland University
Cooperative Research Centre for Sustainable Forest Landscapes, Melbourne University
Curtin Business School
Faculty of Business and Law, Edith Cowan University
Faculty of Community Services, Education and Social Services, Edith Cowan University

PATREC research collaborators 2006
Housing and Urban Research Institute of WA, Curtin University of Technology/Murdoch University
School of Population Health, University of Western Australia
School of Public Health, Curtin University of Technology
Institute for Sustainability and Technology Policy, Murdoch University
John Curtin Institute of Public Policy, Curtin University of Technology
Murdoch Business School
Research Institute for Sustainable Energy, Murdoch University
School of Urban and Regional Planning, Curtin University of Technology
School of Psychology, Murdoch University
School of Economics and Commerce, The University of Western Australia Business School

Research Partners

The principal research partners of PATREC and its collaborating university research teams during 2006 are shown in the table below.

PATREC research funding partners 2006
Australasian Railway Association Inc
Australian Railroad Group Pty Limited
Australian Research Council
Centre for Excellence in Rail Training (CERT)
City of Cockburn
City of Gosnells
City of Joondalup
City of Melville
City of Perth
City of Rockingham
City of Swan
CRC for Rail Technology
Department for Planning and Infrastructure (WA)
Department of Housing and Works (WA)
East Perth Redevelopment Authority
Fremantle Ports
LandCorp (Western Australian Land Commission)
Main Roads WA
Midland Redevelopment Authority
Office of Crime Prevention WA
Peet Limited
Public Transport Authority (WA)
QR (Queensland Rail)
Town of Kwinana
WestNet Rail Pty Limited
Western Australian Planning Commission

Research Projects 2006

Total grant funding facilitated by PATREC for research projects commenced and/or completed in 2006 and paid to PATREC's participating universities during the year was

\$793,000. **Appendix A** at the rear of this report contains information on the scope and purpose of research these projects; **Appendix C** shows grants received during 2006 and their distribution among PATREC's participating universities. An overview of projects in progress or completed in 2006 is shown below.

Research Project	Funding Partner(s)	Collaborating University(s)	Description
Travel behaviour and economic impacts of transit oriented development (TOD)	Australian Research Council, Wellard Stn JV, WA Planning Commission (WAPC), WA Public Transport Authority (PTA), LandCorp, Midland Redevelopment Authority (MRA), East Perth RA (EPRA), Cities of Cockburn, Melville, Rockingham & Kwinana	UWA, Curtin	A four-year longitudinal study aimed at describing and modelling impacts of transit-led development in SW rail corridor on travel behaviour and economic development
TOD performance measurement	Dept for Planning & Infrastructure, Public Transport Authority and PATREC	Murdoch	Definition and development of measures of performance for TOD precincts
Housing choices in TOD precincts♦	WA LandCorp, WA Dept of Housing and Works	Curtin	The nature and quantity of demand for medium density housing in TOD precincts
Rail competition policy fellowship	Australian Railroad Group Ltd (ARG)	Curtin	Evaluate impacts of national competition policy on rail infrastructure investment
Perth freight model	WAPC, Main Roads WA, City of Perth, MRA, EPRA, Fremantle Ports	UWA, ECU	Develop model of freight movements by road and rail for of corridor and location optimisation
Public Transport Strategic Planning	Public Transport Authority WA	Murdoch, Curtin	Assist the PTA to define and research issues for innovative strategic planning of PT services
Port performance	Department for Planning and Infrastructure	Curtin	An examination of governance and performance issues in WA ports
Rail sector workforce planning	Rail CRC, WA PTA, Centre for Excellence in Rail Training (CERT), Queensland Rail, Aust Rwy Assoc, ARG Ltd, MVM Rail PL	UWA, Curtin	Estimating future demand and supply of skilled labour in the Australian rail industry
Rail safety culture♦	PATREC	Murdoch	Piloting survey instrument to benchmark safety culture in Australian rail industry
Marine safety fellowship	WA DPI	UWA	Develop and measure effectiveness of evidence-based safety countermeasures
Youth rail♦	WA Office of Crime Prevention, WA PTA, Cities of Armadale, Gosnells, Joondalup & Swan	ECU, Curtin	Developing youthwork strategies for managing crime and anti-social behaviour in rail station precincts
Short history of WAGR	WA PTA	Murdoch	Short history of WA Government Railways 1902-2003

♦ Project completed in 2006.

Publications

All publications produced in connection with PATREC research projects are shown in Appendix A. Papers and presentations made to PATREC conferences and seminars are available to be downloaded from PATREC's website, www.patrec.org. During 2006 PATREC commenced publishing a new series of Working Papers reporting outcomes from selected PATREC research projects.

Australian Transport Research Forum, 1975-2006

PATREC's website includes a database of all papers presented to the Australian Transport Research Forum (ATRF) from its first meeting in 1975 up to date (ATRF2006) (www.patrec.org/atrf/index.php). This was updated to include 200 papers and presentations delivered to ATRF 2006 in Queensland.

Copies of all papers delivered at ATRF meetings since their inception in 1975 are available at this URL. Papers from 1975 to 1999 have been manually scanned and stored as PDF image files. Papers since 2000 are searchable PDF text files. Presentations stored as PowerPoint files have also been provided from 2005 onwards. Where requested by author(s), presentations only have been removed, updated and stored as PDF text files. Assistance to cover a portion of the cost of compiling this very large database was provided by the organisers of ATRF 2004 (Adelaide), the Bureau of Transport and Regional Economics and the WA Department for Planning and Infrastructure.

* * *

APPENDIX A: Research Programs

Transit Oriented Development in Western Australia

This is an important theme in PATREC-sponsored research. Projects that were commenced or completed in 2006 are listed below. Substantial further research is planned for 2007.

Transit oriented development (TOD) is a form of urban design comprising medium and high-density mixed land uses within precincts of walkable radius (generally up to 400 metres) centred on public transport nodes (most often railway stations). The aim of TOD is to facilitate the growth of strong urban activity centres, supported by and supporting the public transport system, in the context of Western Australia's Network City urban development strategy. They are characterised by walkable catchments, a variety of housing styles and densities, and mixed land uses. This will involve coordinated actions by State agencies, local governments and the private sector, within an innovative framework of land use regulation and public transport infrastructure development. The State's TOD coordinating committee has developed a close relationship with PATREC, which is undertaking research to improve understanding of process issues and to measure outcomes from transit oriented development.

Obstacles and Opportunities for TOD in Perth

Chief Investigator: Asst Prof John L Renne (Research Fellow, Murdoch University)

Completed 2005 www.patrec.org/conferences/TODJuly2005/papers/Renne%20WA%20paper.pdf.

Interviews and focus groups were conducted with stakeholders from local and State governments and the urban development industry, to identify commonly held objectives for TOD and substantive and process issues seen to be inhibiting progress in planning and implementation. This project was partially funding by the Department for Planning and Infrastructure WA.

Demand for housing in TOD precincts in Perth

Chief Investigator: Prof Fiona Haslam McKenzie (Curtin University of Technology), with

Research Associate: Carlindi Holling

Completed 2006

This qualitative and quantitative research study identifies the characteristics of households and individuals likely to choose to live in TOD precincts and the housing features which are sought after in TOD precincts, and evaluates opportunities for affordable housing in TOD precincts. The research used a major survey questionnaire, focus groups, interviews with selected estate agents and housing providers and analysis of census and other statistical data. This project was funding by LandCorp (the WA Land Commission) and the WA Department of Housing and Works.

Impacts of transit led development in a new rail corridor

Chief Investigators: Prof JHE Taplin AM, Prof FN Affleck, Assoc Prof C Curtis, Dr Min Qiu, Dr Doina Olaru (The University of Western Australia, Curtin University of Technology)

The Government of WA is investing \$1.5 billion to build a new strategic railway corridor through the southern suburbs of the Perth, adding 73 km to the electrified passenger rail network, to commence operating in mid-2007, largely through 'green fields'. To facilitate accessibility and economic opportunity, government and the private sector are planning for TOD communities at suitable station precincts. The main purpose of the study is to capture the effects of these developments on emerging travel behaviour and on choice of location and housing type. Current travel models are calibrated from past surveys; to evaluate the impact

of TOD a revealed/stated preference survey on transport modal choices will be used. The results of the RP/SP survey will be used to update Perth's STEM model to assess the travel impacts of the novel features of TOD. This project is supported by an ARC Linkage grant (LP:0562422) and eleven industry sponsors: The Peet Southern JV Pty Ltd, Department for Planning and Infrastructure WA, LandCorp, Public Transport Authority WA, Subiaco Redevelopment Authority, East Perth Redevelopment Authority, Midland Redevelopment Authority, City of Cockburn, City of Melville, City of Rockingham and the Town of Kwinana.

A genetic algorithm for urban layout design and optimisation

PhD Candidate: Yu Chao Sun (The University of Western Australia)

Performance Measures for TOD Precincts

Chief Investigator: Asst Professor John Renne, the University of New Orleans (Research Associate, Institute of Sustainability and Technology Policy, Murdoch)

This project is developing a suite of measures of performance aimed at providing a basis for ex post evaluation of transit oriented developments. This project is supported by the WA Department for Planning and Infrastructure and the Public Transport Authority.

Planning and Transport Modelling Program

Following examination of all of the principal transport models used by transport planning agencies in Western Australia (reported in MAP Taylor and D Scrafton (2004), *Review of the Main Roads Western Australia (MRWA) Transport Model, An Overview of the Findings*), the State Government of WA initiated a program of research and education through PATREC aimed at making more effective use of these models. This program has two major components, a suite of research projects (outlined below) and a training program, comprising a number of short courses to familiarise non-technical planning staff with available modelling tools and with the uses of specific applications.

This program is supported by a number of State government agencies (the Department for Planning and Infrastructure, Main Roads WA, the Public Transport Authority, Fremantle Ports and the East Perth and Midland Redevelopment Authorities) and the City of Perth. The program is focussing on the following projects.

A freight model for Perth

Chief Investigator: Dr Min Qiu, Director, PTMP (The University of Western Australia)

This project is building a new freight model of Perth with a view to optimising freight corridor choices and major facility locations.

Estimating a freight trip matrix for the Perth metropolitan area

MEng candidate: Wen Huang (Tongji University, Shanghai)

Masters degree candidate Mr Wen Huang is studying at The University of Western Australia while completing his degree at Tongji University.

Enhancing the Strategic Transport Evaluation Model

Chief Investigator: Adjunct Prof Dr Peter Lawrence (Edith Cowan University)

The aim of this research is to replace the trip generation stage of STEM (Strategic Transport Evaluation Model) with a module that generates trip chains and to enhance the

mode choice module. This would involve replacing of current regression-based algorithms with a range of new approaches including, for example, logit and discrete choice modelling.

Development of trip generation database

Chief Investigator: Dr Doina Olaru, Lecturer (The University of Western Australia)

The PTMP team will assist the principal project sponsors to specify and scope a project to develop a trip generation database, similar to the UK's TRICS, for transport modelling, transport impact assessments, and parking standards in town planning schemes.

Marine Safety

This research program is being undertaken by the School of Population Health in The University of Western Australia. Beginning in 2004, the program has been supported by a multi-year funding program by the Marine Safety Directorate in the Department for Planning and Infrastructure WA, and was extended during 2006 for a further three years. The program leader is Senior Research Fellow Dr Terri Pikora.

Defining marine-related injuries and incidents

Chief Investigator: Dr Terri Pikora (The University of Western Australia)

This project developed definitions related to marine and boating-related fatalities, injuries and incidents. It provides a list of key definitions to guide future research in the area of marine safety research, both at a state and national level.

Publications: Pikora, Terri J (2004). *Definitions for Marine Safety Research*. Report to the Marine Safety Directorate, Department for Planning and Infrastructure, Western Australia. Injury Research Centre, School of Population Health, The University of Western Australia, report RR 151; Pikora, Terri (2005). "Marine safety research in Western Australia". Presented to the *PATREC Research Forum*, Perth.

Analysis of existing marine-related injury and incident data sets

Investigators: Dr Terri Pikora, Dr Rina Cercarelli (The University of Western Australia)

This project reported on the range of marine and boating-related fatality, injury and incident data that are currently available in Western Australia. These data sets include those from the health sector (such as the death data and the hospitalisation data), the marine incident data as reported to the Department for Planning and Infrastructure, and marine search and rescue data as reported to the WA Water Police. This research was one of the first either nationally or internationally, to obtain and report on these data sets together. It provides current information on marine and boating-related injuries and incidents.

Publications: Pikora TJ (2005), "Boating-related fatalities, injuries and incidents in Western Australia, 1989-2003", presentation to annual *Sea Rescue Conference*, South Perth; Pikora, Terri (2005), "Boating-related fatalities, injuries and incidents in Western Australia", presented to *Marine Safety 2005 Conference*, Hobart, April 2005; Pikora, Terri J and L Rina Cercarelli (2004), *Quantifying Boating-Related Fatalities, Injuries and Incidents in Western Australia*, Report to the Marine Safety Directorate, Department for Planning and Infrastructure, Western Australia. Injury Research Centre, School of Population Health, The University of Western Australia, report RR 154.

Survey of recreational boaters attending boating safety courses in WA

Investigators: Dr Terri Pikora, Dr Rina Cercarelli (The University of Western Australia)

The aims of this project are: To determine the characteristics of recreational boaters who participate in boater education training courses prior to the introduction of compulsory

competency training; and To evaluate boater education safety courses. This research will assist in the identification of promotional strategies that may be used to assist in encouraging boaters to undertake boater training. This research will involve training courses that are conducted in both metropolitan and rural areas of Western Australia.

Publications: Pikora, Terri J. and Cercarelli, LR (2005). “Survey of Recreational Boaters Voluntarily Attending Boating Education Courses in Western Australia”. Report to the Marine Safety Directorate, Department for Planning and Infrastructure, Western Australia. Injury Research Centre, School of Population Health, The University of Western Australia, report RR 156.

Identifying the factors related to the reporting of marine incidents

Chief Investigator: Dr Terri Pikora (The University of Western Australia)

There appear to be a number of marine-related incidents that are not reported to the Department for Planning and Infrastructure, resulting in underestimation of marine-related incidents for commercial and recreational vessels. The aims for this project were to identify the barriers to the reporting of marine-related incidents in WA; to identify ways to encourage boaters to report marine incidents; to identify which items on the MID reporting form need to be modified to improve both the reporting of incidents and the quality of the data reported; and to identify if there is a need to conduct an education program related to the incident reporting process. This project involved conducting in-depth interviews with recreational and commercial boaters in both metropolitan and rural areas. The results have assisted in identifying aspects of the MID reporting form that may require modification and strategies to encourage boaters to report incidents.

Publications: Pikora, TJ and Williams HA (2005), “Identifying Factors to Improve the Reporting of Marine-related Incidents in Western Australia”. Injury Research Centre, School of Population Health, The University of Western Australia, report RR 170.

Survey of risk factors associated with marine-related injuries & incidents in WA

Chief Investigator: Dr Terri Pikora (The University of Western Australia)

The aim of this project is to determine factors that may be associated with marine-related injuries and incidents. These may include those related to individuals’ age, gender, experience, knowledge of safety procedures and/or knowledge of safety requirements; behavioural factors, e.g. alcohol consumption; level, currency and quality of boater training and/or wearing of PFDs; social factors, e.g. number of passengers, beliefs/perceptions about acceptable behaviour; and environmental factors, e.g. weather conditions, size and type of vessel. This project will seek to determine, at a population level, the number, level of severity and outcome of boating related injuries and incidents. It will also lead to the development of a conceptual framework for boating-related injuries and incidents among WA boaters.

Publications: Pikora, TJ (2006). “A survey of the attitudes and safety behaviour among recreational vessel owners in Western Australia”. Injury Research Centre, School of Population Health, The University of Western Australia, Perth. ISBN 1 876999 93 4

Development and piloting of a logbook to determine the level of exposure to the risk of injury among recreational boaters

Investigators: Dr Terri Pikora, Heather Williams (The University of Western Australia)

This project will develop exposure data in relation to the amount of time spent boating. There are data indicating the number of registered vessels, but there are no data on the number of boats or the number of boaters. The aim of this project is to develop and pilot a

log book to collect this data. Information collected will include the frequency of vessel use, the length of time that vessels are used and activity types.

Publications: Williams HA, Pikora TJ (2006). “Development and piloting a log book to determine the level of exposure to the risk of injury among recreational boaters. Injury Research Centre, School of Population Health, The University of Western Australia, Perth. ISBN 1 876999 90 X; Williams, HA and Pikora, TJ (2007). “A method of measuring recreational boating exposure”, Australian and New Zealand Journal of Public Health, vol 31, No 1, p 88.

Railway safety and security

PATREC’s program in this area has developed significantly since commencement in 2005, and now involves two major initiatives.

Safety Culture in the Railway Industry

Benchmarking Safety Culture in the Australian Railway Industry

PbD candidate: Izumi Hart, School of Psychology, Murdoch University

The aim of this research is to develop instruments to measure safety culture in Australia’s rail industry, to administer these in a diverse sample of rail organisations and to benchmark ‘safety culture’ the industry. It will also identify significant factors associated with a sound safety culture and investigate their relationships. The research will develop a set of diagnostic tools which can be used by the industry. Australian Standard AS4292 ‘Rail Safety Management’ requires that rail operators and track owners “include in [their] safety management system methods to develop and maintain a positive safety culture.” There is therefore a need for recognized systems for measuring safety culture and interpreting its outcomes. Safety culture has enduring **trait**-like qualities that are not easy to change, and is defined by Reason as what an organisation ‘is’ and ‘has’, i.e. the beliefs, assumptions and values of its members regarding safety, and the structures, practices, controls and policies designed to enhance safety. This research is being supported by the Australasian Railway Association and by a number of Australian and New Zealand rail operators and track owners.

Preliminary investigation into benchmarking the safety culture in the Australian rail industry

Chief Investigator: Izumi Hart (Murdoch University)

The quality of safety culture has been subject to criticism in some Australian railways. ‘Safety culture’ is the underlying values, expectations and assumptions related to safety in a workplace; in contrast, ‘safety climate’ characterises the perceptions and attitudes about the way safety is practised and managed in a workplace. The aim of this research project was to pilot a survey instrument to assist in evaluating the quality of safety culture in rail organisations. The experimental survey instrument comprised questions about six main cultural dimensions: safety values, beliefs and assumptions; leadership and safety; structure of safety (the social meaning of safety); cognitive styles; behavioural norms; and drivers of safety performance. This research was supported directly by PATREC, and its findings are reported in PATREC Working paper No 4. Izumi Hart is currently undertaking doctoral research on this topic under the supervision of Assoc Prof Laurence Hartley.

Publications: Hart, Izumi (2005), “Preliminary investigation of benchmarking the safety culture of the Australian rail industry”, presented to the *PATREC Research Forum 2005*, Perth; Hart, Izumi (2005), *Railway Safety Culture Survey 2005: Report to the Advisory Panel*, PATREC Working Paper 4.

Public safety in rail station precincts

A youthwork strategy to manage crime and anti-social behaviour in rail station precincts

Chief Investigator: Dr Trudi Cooper (Edith Cowan University) and Dr Terrence Love (Curtin University of Technology)

The hypotheses driving this research, concluded in 2006, were that substantial success in controlling and reducing crime and anti-social behaviour could be achieved by the use of strategies called 'youth work', 'detached style youth work', and 'outreach youth work', and that people who use and 'hang out' in railway stations can be 'diverted' to other non-threatening activities. Public transport throughout the world is a venue for crime and anti-social behaviour. The spaces in and around railway stations are also places where people gather, which can be perceived as threatening to others, who might be deterred from using the rail system. The focus of the research was on deterring and controlling anti-social behaviour in stations and surrounding precincts; it is not directly concerned with controlling behaviour on trains. The approach comprised observation in stations and station precincts, descriptive analysis, workshopping of this analysis with public transit guards and youth workers, and designing, implementing and reporting on a pilot program. This research was funded by the WA Office of Crime Prevention, the Public Transport Authority of WA, and the Cities of Joondalup, Swan, Gosnells and Armadale.

A seminar held to disseminate research outcomes to sponsors and other stakeholders was held at Edith Cowan University in November 2006. Proceedings are available at www.patrec.org/conferences/PATREC_Youth_Rail_Seminar_Nov2006/index.php#papers.

Publications: Cooper, Trudi, Erin Donovan and Terry Love (2007 forthcoming). "Young people in rail environs: An interagency approach to conflict reduction and crime prevention." Paper for presentation to the National Youth Work Conference, Youth Affairs Council of Victoria, Melbourne, May 2007.

Transport economics and logistics

Economic regulation of railways in Australia

This significant two-year program of research conducted by Nick Wills-Johnson at Curtin University of Technology, concluded in February 2007. This program has been extended for a further three years to 2010, with on-going support from a diverse group of Australian railway entities. Included in this program to date have been the following research projects:

The impact of Competition Policy on investment in rail infrastructure

Chief Investigator: Nick Wills-Johnson, ARG Research Fellow (Curtin University of Technology)

The focus of this program of research is Australia's 'third-party access regimes' and the vertical separation of above-rail and below-rail management, which has generally been associated with implementation of these access regimes. The research is examining whether there is evidence that price-based access regulation and vertical separation are inhibiting investment in railway infrastructure. The issue is a complex one, and the investigation is examining institutional, economic and behavioural factors. This independent research is being funded by the Australian Railroad Group Pty Ltd. A symposium on this topic was held in Perth in October 2006, proceedings from which are available at www.patrec.org/conferences/PATREC_Rail_Symposium_Oct2006/index.php.

Publications: Wills-Johnson, Nick and Fred Affleck (2005). "Regulating Rail for Growth: Alternative regulatory paradigms", in the Proceedings of the *Australasian Transport Research*

Forum 2005, Sydney; Bloch, H, P Kenyon and N Wills-Johnson (2005). “Estimation of the X-Factor in CPI-X Regulation of the Western Australia Rail Industry”. *The NRRRI Journal of Applied Regulation*, vol 3: 79-94. Wills-Johnson, N and Affleck, F (2006). A Problem Looking for a Solution or a Solution Looking for a Problem? Economic Regulation of Railways in Logistics Chains”. in the Proceedings of the *Australasian Transport Research Forum 2006*, Brisbane. Wills-Johnson N (2006). “Competition in Rail: A likely proposition?” Wills-Johnson, N. (2006). *Competition in Rail: A likely proposal?* 35th Australian Conference of Economists, Perth, September 2006. PATREC Working Paper 5. Wills-Johnson N (2006), “Railways and the Just Price”. PATREC Working Paper 6. Wills-Johnson N (2006). “A Problem Looking for a Solution or a Solution Looking for a Problem? Economic Regulation of Railways in Logistics Chains”. PATREC Working Paper 7. Wills-Johnson N (2006). “Future Directions in Railway Management and Regulation”, PATREC Working Paper 8. Wills-Johnson N (2006). “The Networked Firm: A Framework for RBV [resource based view]”. PATREC Working Paper 9. Wills-Johnson N (2007), “Separability and Subadditivity in Australian Railways”. PATREC Working Paper 11. Wills-Johnson N (2007): Competition Policy and Railway Investment - Project Summary, PATREC Working Paper 12. Wills-Johnson, N, (forthcoming 2007), “Economic Regulation of Railways in Logistics Chains: A Problem Looking for a Solution or a Solution Looking for a Problem?” *Agenda*.

Factors Contributing to Under-Provision of Rail Infrastructure Capacity

Chief Investigator: Prof Fred Affleck (Curtin University of Technology)

This research uses two case studies – the coal railway networks of Queensland and in the Hunter Valley of New South Wales – to examine factors that may be contributing to under-investment in railway infrastructure. This research was undertaken for a paper presented to the 2005 regulatory conference of the Australian Competition and Consumer Commission.

Publications: Affleck, Fred (2005), “Exploration of Some Factors Contributing to Under-Provision of Infrastructure Capacity: Coal Railway Networks in Queensland and Hunter Valley of New South Wales”, in proceedings of *ACCC 2005 Regulatory Conference*, Gold Coast, 28-29 July 2005.

Freight logistics

A freight model for Perth

Investigators: Dr Min Qiu and Wen Huang (The University of Western Australia)

This project, part of the Planning and Transport Modelling Program (see above), will build a new freight model of Perth with a view to optimising freight corridor choices and major facility locations. This need for this project was identified at PATREC’s Industry Conference on Maritime Logistics: Land-side issues and opportunities (November 2004) (www.patrec.org/conferences/MaritimeLogistics2004/MaritimeLogistics.html).

Estimating a freight trip matrix for the Perth metropolitan area

MEng candidate: Wen Huang (Tongji University, Shanghai)

Masters degree candidate Mr Wen Huang is studying at The University of Western Australia while completing his degree at Tongji University.

Intermodal planning: optimal location of container yards

PhD Candidate: Dean Davidson (The University of Western Australia)

Vehicle Routing in Logistics: Genetic Algorithms for Stochastic Vehicle Routing Problem with Simultaneous Delivery and Pick-up

PhD Candidate: Lixi Zhang (The University of Western Australia)

An inventory of railway skills and a long-term forecast of requirements

Chief Investigator: *Dr Michael Dockery* (Curtin University of Technology)

This project is aimed at providing information to the railway industry on recruitment and training needs in the medium-to-long term, segmented by major region and competency groups. It will create an inventory of railway human resources, and produce estimates of likely exits and the resulting requirements for new recruitment and training. Data is being collected from rail systems and from other available sources. This research is being supported by the CRC for Rail Technology, Queensland Rail, the Australian Railroad Group Pty Ltd, the Public Transport Authority of WA and CERT (Centre for Excellence in Rail Training).

Publications: Dockery, M. and Mahendran, A. (2006). "Skill Shortages in the Australian Rail Industry", presented at the 'Constraints to Full Employment Conference' (incorporating the 8th Path to Full Employment Conference and 13th National Conference on Unemployment), University of Newcastle, December 2006.

Urban container logistics: a global local problem (two case studies)

Investigators: Prof Emeritus Trevor Heaver (University of British Columbia) and Prof Fred Affleck (Curtin University of Technology)

Achieving a smooth and balanced integration between the multi-stage functions of handling freight between ship and shore has always been challenging. Imbalances between functions give rise to discontinuities in processes and to bottlenecks. The challenges of integration are greater in container transport than in bulk transport because of the much larger number of organizations that are involved in the cargo on a container vessel than on a bulk ship. The imbalances may show up as queues of trucks at terminal gates or delayed trains. However, these are only the evident symptoms of problems that are associated with a wide array of aspects of the port-inland interface. This study is examining two case studies, the ports of Vancouver Canada and Fremantle Australia.

Publications: Heaver, Trevor (2004), "Maritime Logistics: landside issues and opportunities", report on the conference of the Planning and Transport Research Centre, Fremantle, 25-26 November 2004. (www.patrec.org/conferences/MaritimeLogistics2004/Summary%20of%20proceedings%20and%20outcomes%20text.pdf)

A model for government funding of private sector rail infrastructure

Chief Investigator: Prof Fred Affleck (Murdoch University)

Railways in most of Australia were 'privatised' between 1997 and 2002. A result of this dramatic change in governance models that had applied for well over a century is that governments have lost their ability, cases of market failure, to invest directly in railway infrastructure or operating assets. In a number of jurisdictions, including a number in North America and Australasia, there are programs through which governments provide funding for targeted rail investment on a range of terms and conditions. Drawing on these examples, the aim of this research, conducted in 2004, was to create guidelines for potential application in WA, to enable productive and prudent investment by government in targeted railway infrastructure. Funding for this research was provided by the WA Department for Planning and Infrastructure.

Publications: Affleck, FN, J Ryan and JHE Taplin (2004), *Report on Options for Public Assistance for Rail Infrastructure Financing*, report for the WA Department for Planning and Infrastructure, Perth.

Rail branchline options in New South Wales

Chief investigator: Prof Fred Affleck (Murdoch University)

This project, conducted in 2003, assisted the NSW Grain Infrastructure Advisory Committee to complete a study of options for the future of some 20 grain branchlines in the State. This study was funded by the NSW Ministry of Transport.

Publications: Grain Infrastructure Advisory Committee (2004), *Report on Road/Rail Options for Grain Logistics* www.transport.nsw.gov.au/giac/GIAC-Report.pdf.

Future directions for the Australian Logistics Council

Chief investigator: Prof Fred Affleck (Murdoch University)

This research consultancy, conducted in 2004, was commissioned by the Chairman of the Australian Logistics Council (ALC), to examine the functions and programs of the ALC, and provide advice on new governance and management structures and a work program. As a result of this work the Council engaged a new management team and has adopted a number of new issue management strategies.

Publications: Australian Logistics Council (2004), *Report on Future Directions*, to the Chairman of the Australian Logistics Council, by Professor Fred Affleck, Perth.

A methodology for establishing trust in logistics peer-to-peer environments

PhD candidate: Farookh Hussain (Curtin University of Technology)

Completed: 2006

Farookh Khadeer Hussain is conducting research in this topic for his PhD thesis, under the supervision of Professor Elizabeth Chang, Director of the Centre of Extended Enterprises and Business Intelligence, Curtin Business School.

Publications: Chang, E, FK Hussain, and T Dillon (2005), "Reputation ontology for reputation systems", Lecture Notes in *Computer Science*, vol. 3762/2005, 957; Chang, E, FK Hussain and T Dillon (2005), "CCCI trustworthiness measure for agent networks", *Proceedings of the 2005 IEEE/WIC/ACM International Conference on Intelligent Agent Technology (IAT)*; Chang, E, FK Hussain and T Dillon (2005), "Ontology based trust and reputation for distributed anonymous environments", *Proceedings of the IEEE Systems Management and Cybernetics Conference*; Chang, E, FK Hussain and T Dillon (2005), "Reputation ontology for reputation systems", *Proceedings of the On the Move to Meaningful Internet Systems 2005*; Chang, E, FK Hussain and T Dillon (2005), "Trustworthiness measure for e-service", *Proceedings of the Third Annual Conference on Privacy, Security and Trust*; Chang, E, FK Hussain and TS Dillon (2005), "Trust modelling using trust case diagrams", *Proceedings of the Second Workshop on Secure Web Services*; Chang, E, FK Hussain, TS Dillon, and P Thomson (2005), "Trust and reputation modelling language", *Proceedings of the First IFIP/WG2.12 and WG 12.4 International Workshop on Web Semantics*; Chang, E, P Thomson, F Hussain and TS Dillon (2005), "Trust ontology for quality of business service assessment", *Proceedings of the 4th WSEAS International Conference on Information Security, Communications and Computers*; Chang, E, T Dillon and FK Hussain (2005), "Formalizing a grammar for reputation in peer-to-peer communication", *Proceedings of the Seventh International Conference on Information Integration and Web-based Applications and Services*; Chang, E, TS Dillon and FK Hussain (2005), "Reputation ontology", *Proceedings of the First IFIP/WG2.12 and WG 12.4 International Workshop on Web Semantics*, Chang, E, TS Dillon and FK Hussain (2005). "Trust and reputation", Invited Keynote for *IFIP Academy on the State of Software Theory and Practice*; Chang, E, TS Dillon and FK Hussain (2005), "Trust for e-business", Invited Keynote for the *3rd International Conference on Information Technology and Applications*; Hussain, FK, E Chang, and TS Dillon (2005). "Markov model for managing dynamic trust", *Proceedings of IEEE's 3rd International Conference on Industrial Informatics*; Hussain, O, E Chang, FK Hussain, B Soh and TS Dillon (2005), "A methodology for determining riskiness in peer-to-peer communication", *Proceedings of IEEE's 3rd International*

Conference on Industrial Informatics; Hussain, O., E Chang, FK Hussain, TS Dillon and B Soh (2005), “Modelling the risk relationships and defining the risk set”, *Proceedings of the LatAm Collaborative Electronic Commerce Technology and Research Conference*.

Information Hiding and Tamper Detection for Ubiquitous RFID-enabled Supply Chain

PhD candidate: Viddy Potdar (Curtin University of Technology)

At the end of 2006, Vidyasagar Potdar submitted his PhD thesis and subsequently received his PhD for research in this area, supervised by Professor Elizabeth Chang, Director of the Centre of Extended Enterprises and Business Intelligence, Curtin Business School.

This research concerns ‘information hiding’, for protecting intellectual property (steganography) and is focussed on developing digital watermarking for use in the logistics industry. The main aim of his research is to propose a new steganographic model that would achieve high embedding capacity as well as low perceptibility. Image Steganography is one sub-branch of digital steganography. The fundamental requirements of any steganography model are imperceptibility against detection, high embedding capacity and robustness against attacks. This research is being conducted under the supervision of Professor Elizabeth Chang.

Publications: Potdar, V, MA Khan, E Chang, M Ulieru and P Worthington (2005), “E-Forensics Steganography System for Secret Information Retrieval”, *International Journal of Advanced Engineering Informatics*, vol. 19, 235-241; Potdar, V and E Chang (2005), “Scalar quantization based robust image watermarking algorithm in the wavelet domain”, *Proceedings of the ICT WA 2005 Conference*; Potdar, V, C Wu and E Chang (2005), “Tamper detection for ubiquitous RFID-enabled supply chain”, *Proceedings of the International Conference on Computational Intelligence and Security (CIS)*; Potdar, V, S Han and E Chang (2005), “A survey of digital image watermarking techniques”, *Proceedings of IEEE’s 3rd International Conference on Industrial Informatics*; Potdar, V, S Han and E Chang (2005), “Dictionary module and UDC: Two new approaches to enhance embedding capacity of a steganographic channel”, *Proceedings of IEEE’s 3rd International Conference on Industrial Informatics*; Potdar, V, S Han and E Chang (2005). “Fingerprinted secret sharing steganography for robustness against image cropping attacks”, *Proceedings of IEEE’s 3rd International Conference on Industrial Informatics* (received Best Paper (Presentation) Award and Invited for IEEE Transactions; Potdar, Vidyasagar (2005), “Information Hiding and Tamper Detection for Ubiquitous RFID-enabled Supply Chain”, *Presented to the PATREC Research Forum 2005*.

Transport and the environment

Sustainable transport fuels

Supply Conditions & their Bearing on the Adoption of Alternative Fuel Vehicles & Hybrid Electric Vehicles

PhD candidate: Zeenat Abdoolakhan

Transforming the Australian vehicle fleet

Investigators: Zeenat Abdoolakhan, Prof John Taplin, Dr Doina Olaru, Brett Smith (The University of Western Australia)

Increasing petrol prices impacting directly on consumers’ budgets have recently triggered wide interest in alternative fuel vehicles and new technology cars. Using an early pilot study, this project has developed a proposed research method to assess the influence of various choice factors in the decision to purchase a new vehicle – type and size of vehicle, type of fuel, operating cost, vehicle purchase price and cargo space – within a discrete choice model framework. The model also accounts for individual characteristics and latent lifestyle and belief factors.

Publications: Abdoolakhan, Zeenat (2005), "Viability of Alternative Fuels and New Technology Vehicles. Presented to the *PATREC Research Forum 2005*, Perth; Olaru, D, Z Abdoolakhan and N Smith (2005), "Choice factors in the adoption of alternative fuels and new technology vehicles: An SP approach", *27th Conference of the Australian Institutes of Transport Research*, Brisbane; Taplin, John and Zeenat Abdoolakhan (2005), *Transformation of the Australian Car Fleet: Likely Responses to Current and Projected Petrol Price*, Information Management and Transport, School of Economics and Commerce, The University of Western Australia, PATREC Working Paper 2.

Transport and the Environment

Development of policies to ameliorate the environmental impacts of cars in Perth City, using the results of a state preference survey and air pollution monitoring

PhD Candidate: Sharif Siddique (The University of Western Australia)

Completed: 2006

Sharif's PhD research examined the impact of travel related policy instruments on air quality within the central business district of Perth. It aims at joint development of a genetic algorithm and a stated preference survey to optimise policies for ameliorating the environmental impacts of transport. This research was conducted under the supervision of Prof John Taplin, in the School of Economics and Commerce in the UWA Business School.

Publications: Siddique, Sharif (2005), "Modelling of Transport Mode Selection by Travellers to Perth City", presented to the *PATREC Research Forum 2005*, Perth.

Integrating economic, environmental & social factors for prioritising transport policies

PhD Candidate: Clare Yu (The University of Western Australia)

The focus of this research is to determine the relative weights of economic, environmental and social factors used in formulating transport policies based on multi-criteria analysis. Discrete choice modelling, based on revealed and stated preference survey data, will be used to disclose individuals' willingness to pay for maintained or improved environmental and social outcomes. Significantly, the relative importance of the economic, environmental and social factors is determined at the regional level. This research is being supervised by Dr Min Qiu of the School of Economics and Commerce, UWA Business School.

Publications: Yu, Clare (2005), "Willingness to Pay for Environmental Externalities, for Self-Interest or for Community-Interest?" presented to the *PATREC Research Forum 2005*, Perth.

Indigenous management of transport systems

Who really makes the decisions?

MPhil candidate: John Smoker (Murdoch University)

This research will examine the development, implementation and acceptance of shared responsibility agreements by Indigenous people in developing community sustainability in partnership with all levels of government, in particular the effectiveness of new arrangements being implemented by indigenous coordinating centres in the Kimberley region of Western Australia, with special on the effectiveness and outcomes of the Regional Partnership Agreements (RPAs) and Shared Responsibility Agreements (SRAs) for the remote communities of Balgo and Kalumburu, and processes for creating new local representative bodies being developed to replace the ATSIC regional councils. This research is being supervised by Prof Peter Newman, Director of the Institute for Sustainability and Technology Policy, Murdoch University. Funding for incidental expenses is being provided by Main Roads Western Australia.

Short history of the WA Government Railways

Investigators: Prof Fred Affleck and Linley Batterham (Murdoch University)

The former WA Government Railways Commission (the WAGR, established in 1902) ceased to exist when the Public Transport Authority of WA was established in 2003. A substantial but partial history (1950-1976) of Westrail (the trading name used by the WAGR before privatisation of its freight business in 2000) was published by Fred Affleck in 1978. The WA Section of the Australian Railway Historical Society continues to publish short articles on the history of the WAGR and the Midland Railway Company of WA Ltd (absorbed by the WAGR in 1964). The purpose of this research, in progress, is to provide a complete short history of the WAGR from its origins in 1879 to 2003, where possible incorporating oral history sources. This project is supported by funding from the Public Transport Authority of Western Australia.

Publications: Affleck, Fred (1978), *On Track: The Making of Westrail, 1950-1976*, Perth.

APPENDIX B: PATREC Working Papers

(available at www.patrec.org/publications/index.php?category=W1)

- 1 **Renne, John L** (2005). *Transit-Oriented Development in Western Australia: Attitudes, Obstacles and Opportunities*. Report for the Department for Planning and Infrastructure WA.
- 2 **Olaru, Doina and Brett Smith** (2005). *Choice factors in the adoption of alternative fuels and new technology vehicles: An SP approach*.
- 3 **Taplin, John and Zeenat Abdoolakhan** (2005). *Transformation of the Australian Car Fleet: Likely Responses to Current and Projected Petrol Price*.
- 4 **Hart, Izumi** (2005). *Railway Safety Culture Survey 2005: Report to the Advisory Panel*.
- 5 **Wills-Johnson N** (2006). *Competition in Rail: A likely proposition?*
- 6 **Wills-Johnson N** (2006). *Railways and the Just Price*.
- 7 **Wills-Johnson N** (2006). *A Problem Looking for a Solution or a Solution Looking for a Problem? Economic Regulation of Railways in Logistics Chains*.
- 8 **Wills-Johnson N** (2006). *Future Directions in Railway Management and Regulation*.
- 9 **Wills-Johnson N** (2006). *The Networked Firm: A Framework for RBV*.
- 10 **Hornby P. and Wills-Johnson N** (2006). *Quantifying Social Capital*.
- 11 **Wills-Johnson N** (2007). *Separability and Subadditivity in Australian Railways*.
- 12 **Wills-Johnson N** (2007). *Competition Policy and Railway Investment - Project Summary*.

APPENDIX C: Research income 2006

	Grant Agency	Start Date	Income in 2006	Total Grants for Each Project					
				Total	Curtin	ECU	Murdoch	UWA	PATREC
			\$	\$	\$	\$	\$	\$	
Senior Research Fellowship Marine Safety	DPI	13/11/06	(c)	449,236				413,723	35,513
Ports Performance in WA	DPI	1/11/06	15,726	15,726	5,589		10,137		1,258
Rail safety culture definition/measurement (PhD - support for travel and ancillary costs)	Rail operators	1/7/06	10,000	35,250			35,250		
Impacts of transit-led development in a new Corridor (ARC project LP0562422)	ARC & rail entities	31/12/05	110,500	701,551	260,774			440,777	
Rail Competition Policy Research Fellowship	ARG	1/3/05	108,949	239,713	201,288				16,633
Planning & Transport Modelling Program	DPI	1/8/05	119,431	269,835		41,950		202,658	25,227
A Youth work Approach to Managing Anti-Social Behaviour and Crime in Rail Precincts	OCP	1/12/05	79,500	79,500		71,550			
Railway skills inventory and long-term forecasts of supply and demand	Rail CRC	1/12/05	90,000	90,000	90,000				
Market demand for medium density and affordable housing in TOD precincts	LC & DHW	20/12/05	77,248	77,248	69,088				8,160
Performance measurement of TOD precincts	DPI/PTA	3/7/06	66,240	66,240			58,140		-15,015
Public Transport Authority Strategic Planning	PTA	15/5/06	115,496	115,496	106,509		8,986		
Ports Performance in WA	DPI	1/11/06	15,726	15,726	5,589		10,137		1,258
WAGR Short History	PTA	15/8/03	16,500	16,500			13,809		1,191
TOTALS			793,090	2,631,295	1,173,248	113,500	126,322	1,057,158	107,967

Planning and Transport Research Centre

A joint program of Curtin University of Technology, Edith Cowan University, Murdoch University
and The University of Western Australia supported by the Government of Western Australia

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