Australian Government
Australian Research Council

EI 2018 ENGAGEMENT AND IMPACT

# Engagement and Impact 2018

## The University of Sydney

## SYD15 (SS) - Impact

## Overview

### Title

*(Title of the impact study)*

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| Providing more accurate and realistic economic measures for estimating the value of user benefits in transport projects, programs and policies |

### Unit of Assessment

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| 15 - Commerce, Management, Tourism and Services |

### Additional FoR codes

*(Identify up to two additional two-digit FoRs that relate to the overall content of the impact study.)*

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### Socio-Economic Objective (SEO) Codes

*(Choose from the list of two-digit SEO codes that are relevant to the impact study.)*

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| 88 - Transport |
| 91 - Economic Framework |

### Australian and New Zealand Standard Industrial Classification (ANZSIC) Codes

*(Choose from the list of two-digit ANZSIC codes that are relevant to the impact study.)*

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|---|
| 46 - Road Transport |
| 47 - Rail Transport |
| 52 - Transport Support Services |
| 77 - Public Order, Safety and Regulatory Services |

### Keywords

*(List up to 10 keywords related to the impact described in Part A.)*

Valuation of transport user benefits

National economic appraisal parameters guidelines

Values of travel time savings and reliability

Willingness to pay for safety benefits

Discrete choice model analysis

Attribute processing

**Sensitivities**

Commercially sensitive

No

Culturally sensitive

No

**Sensitivities description**

*(Please describe any sensitivities in relation to the impact study that need to be considered, including any particular instructions for ARC staff or assessors, or for the impact study to be made publicly available after EI 2018.)*

**Aboriginal and Torres Strait Islander research flag**

*(Is this impact study associated with Aboriginal and Torres Strait Islander content?*
*NOTE - institutions may identify impact studies where the impact, associated research and/or approach to impact relates to Aboriginal and Torres Strait Islander peoples, nations, communities, language, place, culture and knowledges and/or is undertaken with Aboriginal and Torres Strait Islander peoples, nations, and/or communities.)*

No

**Science and Research Priorities**

*(Does this impact study fall within one or more of the Science and Research Priorities?)*

Yes

| **Science and** | **Practical Research Challenge** |
|---|---|

| Research Priority | |
|---|---|
| Transport | Improved logistics, modelling and regulation: urban design, autonomous vehicles, electrified transport, sensor technologies, real time data and spatial analysis. |
| Transport | Effective pricing, operation, and resource allocation. |

# Impact

**Summary of the impact**

*(Briefly describe the specific impact in simple, clear English. This will enable the general community to understand the impact of the research.)*

Professor David Hensher is a leading international expert in estimating the value of user benefits for the economic appraisal of transport projects. His methods have impacted state and national government guidelines and accurately estimate the cost of new transport projects. This includes values for travel time savings (the dollar value placed on travel time and savings made from reducing travel time), reductions in travel time variability related to congestion and reductions in exposure to injury or death on our roads. In 2013, Hensher's methods increased the value of avoiding loss of human life from $1.5M to over $6M.The Government has now reprioritised public investment in road safety. This improves road traffic safety infrastructure making it more efficient, safe and comfortable.

**Beneficiaries**

*(List up to 10 beneficiaries related to the impact study)*

Users of transport networks

AustRoads (representing all State Road Authorities in Australia)

Industry consortia related to tollroad bids (Thiess, John Holland, Macquarie, ABN Amro Transurban, CP2)

Transport Authorities (NSW Transport, Qld , Vic Road, Infrastructure NSW), The Netherlands Ministry of Infrastructure and the Environment

Major infrastructure projects (WestConnex, Sydney Metro, all Tollroads in Australia and NZ)

Safety assessment authorities (Federal Office of Road Safety)

Lower income households in Australia (including community transport organisations)

Associations (Bus NSW, BusVic, NRMA (National roads and motorists association)

Clubs (RACV (Royal Automobile Club of Victoria), RACQ (Royal Automobile Club of Queensland))

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| Transport consultants (GTA Consultants, Deloitte Access Economics, Oxford Economics, Price Waterhouse Coopers, Saha International, Speedrail) |

**Countries in which the impact occurred**

*(Search the list of countries and add as many as relate to the location of the impact)*

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| Australia |
| New Zealand |
| Chile |
| England |
| Wales |
| Scotland |
| Sweden |
| Norway |
| Netherlands |
| United States of America |
| Samoa |
| South Africa |
| Kenya |
| Singapore |
| Hong Kong (SAR of China) |
| Brazil |
| Italy |

**Details of the impact**

*(Provide a narrative that clearly outlines the research impact. The narrative should explain the relationship between the associated research and the impact. It should also identify the contribution the research has made beyond academia, including:*
*- who or what has benefitted from the results of the research (this should identify relevant research end-users, or beneficiaries from industry, the community, government, wider public etc.)*
*- the nature or type of impact and how the research made a social, economic, cultural, and/or environmental impact*
*- the extent of the impact (with specific references to appropriate evidence, such as cost-benefit-analysis, quantity of those affected, reported benefits etc.)*
*- the dates and time period in which the impact occurred.*

*NOTE - the narrative must describe only impact that has occurred within the reference period, and must not make aspirational claims.)*

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| On average, Sydneysiders spend two hours a day wasting time, energy and money travelling around Sydney. Reducing the time people and goods spend in traffic creates better lifestyles and makes industry more productive. With 10% of Australia's GDP linked to moving things, more efficient transport significantly improves our international competitiveness.<br><br>Predicting the number of people who will use new travel infrastructure is the biggest challenge when justifying investment in public transport or toll roads. Overestimating the number of people who will use this infrastructure places a huge financial risk on investors and taxpayers. The valuation of travel time is the key economic framework used in evaluating the user benefits of transport projects. The Value of Travel Time Savings (VTTS) refers to the dollar value placed on travel time and the savings made from reducing it. This includes how much people are willing to pay to make a faster trip. Professor David Hensher from the University of Sydney (USYD) is Australia's pre-eminent expert on travel demand and valuation. He has advised business and government in |

Australia, UK, New Zealand, South Africa, Chile, USA and Fiji. His research is widely used to investigate practical and realistic ways of valuing user benefits that reflect the behaviours of transport users. Key outcomes:

•Increasing the statistical value of avoiding loss of life from $1.5m to $6m. This puts a higher value on human life, ultimately leading to improved road infrastructure safety and reduced fatalities. In 2013, this value was included in the NSW guidelines for transport appraisal
•Differentiating the value of free flow time (no congestion) versus congested time for a specific trip so that value savings are now double for congested time ($36/hour)
•Introducing the value of travel time reliability (the reliability of a mode of travel including delays) to bring greater realism to the value of new infrastructure.

Industry (Deloitte Access Economics, Ernst & Young), transport consultants (Jacobs, GTA, Aecom) and government now use these methods in their project appraisal. John Stanley, ex-Chief Economist, Treasury Victoria says, “Professor Hensher’s influence on the practice of transport appraisal in Australia is without peer.” Kenneth Train, University of California, Berkeley, says “Professor Hensher has developed and applied path-breaking methods to assess the value that consumers place on goods that aren’t bought and sold directly. They have become standard procedures in the field and his findings are widely cited as crucial information for policymaking. He is truly one of the thought-leaders of the world.”

THE HENSHER FORMULA TRANSFORMED THINKING ON VTTS
In 1977, Hensher began the impact pathway publishing Value of Business Travel Time. Dubbed ‘The Hensher Formula’, this pioneering work outlines the behavioural issues required for measuring VTTS. This includes how travel time can be used productively for work (increasingly so in a digital era), that savings in reducing travel time may be used for leisure instead of being traded 100% with business and that shorter trips reduce fatigue creating greater productivity at work or higher satisfaction in leisure. The Hensher Formula was the first to challenge the simplistic cost savings approach, and it continues to be used globally. It markedly lowers VTTS for business-related travel. Lower VTTS, typically 60% of the average wage versus 100%, has serious consequences for forecasting consumer demand, as the benefits are far lower. This has impacted investment in high-speed rail (Cross Rail2, UK) and significantly realigned user benefits for Sydney’s Northwest transport project and the UK High Speed 2 (evidenced in The Economics of High Speed 2, HL Paper 134, House of Lords, Economic Affairs Committee, 2014-15).

VTTS AND THE VALUE OF TRAVEL TIME RELIABILITY (VoR)
The Australian government has used Hensher’s ground-breaking work to develop national guidelines for government-supported project appraisal. As a result, Hensher was engaged by all major toll road private consortia (notably Thiess, John Holland, Macquarie Bank, ABN Amro) to develop crucial new estimates of VTTS (about 20% higher). For the first time he included VoR, the reliability of a mode of travel including deviations and delays. Over 12 studies were completed in Sydney, Melbourne, Brisbane, Auckland and Tauranga. These included the Brisbane Airport link and the Sydney M7 (western orbital). Time benefits (dominating all user benefits at 80%) were typically 30% higher because VoR and in-vehicle time were noted. Since 2011, Hensher has provided modelling and advice to Deloitte and Deloitte Access Economics. “Our academic partnerships with David and ITLS [Institute of Transport and Logistics Studies] are among the very best, most productive and most practically relevant,” says Eamon McGinn, Director, Deloitte Access Economics.

VALUE OF RISK REDUCTION FOR INJURIES AND FATALITIES IN THE ROAD ENVIRONMENT
Prof Hensher was engaged by NSW RTA (Roads and Maritime Services) to rethink the value society puts on a statistical life. Using a Willingness To Pay (WTP) approach, Hensher obtained new values for fatality risk, severe injury risk, injury risk, and minor injury risks. Transport for NSW (TFNSW) and Austroads now recommend these values be used in all transport appraisals. Most importantly, Hensher increased the value of avoiding loss of human life from $1.5m to over $6m.The Government has now reprioritised public investment in road safety. This ultimately improves road traffic safety infrastructure making it more efficient, safe and comfortable. For example, Pacific Highway improvements in safety are measured at 6% of the user benefit (once less than 2%). Using Hensher’s WTP value, The Bureau of Infrastructure, Transport and Regional Economics increased the annualised cost of crashes by 52% to $27.1 billion, which will ultimately reduce accident risks.

**Associated research**

*(Briefly describe the research that led to the impact presented for the UoA. The research must meet the definition of research in Section 1.9 of the EI 2018 Submission Guidelines. The description should include details of:*
*- what was researched*

*- when the research occurred*
*- who conducted the research and what is the association with the institution)*

Since 2002, WTP methods and stated preference (SP) surveys in a discrete choice modelling setting have been recognised as the preferred method to value user benefits (Hensher pioneered SP methods with Jordan Louviere (UniSA)). They have applications in environmental science, health economics and tourism. In 2005, Professor Hensher's publication, 'Applied Choice Analysis' made these methods, including software that estimates WTP, easily accessible to practitioners and researchers.
Professor Hensher has undertaken many studies to advance knowledge of behaviourally appropriate indicators for VTTS, VoR and VRR of injuries and fatalities. These form the foundation for the impacts outlined above.
From 2003 onwards, Professor Hensher continued this research in the area of toll roads (with contributions from John Rose (USYD) and Jordan Louviere). In six years time Sydney will have more road tolls than any other city in the world. Professor Hensher recognised the very real threat of toll saturation. The risk of overvaluing VTTS on new links creates hugely inflated road traffic forecasts. As a result, Professor Hensher lowered VTTS for toll roads, almost halving them. Realistic patronage forecasts ensure there is less financial risk on taxpayers and that toll roads deliver on their promise to communities. Extensive media coverage followed with leading toll road specialist Dr Bain, RBconsult Ltd, UK saying: "That was the best (perhaps scariest!) read I've had in ages."

**FoR of associated research**

*(Up to three two-digit FoRs that best describe the associated research)*

15 - Commerce, Management, Tourism and Services

**References (up to 10 references, 350 characters per reference)**

*(This section should include a list of up to 10 of the most relevant research outputs associated with the impact)*

1. Batley, R. (2015) The Hensher equation: derivation, interpretation and implications for practical implementation, Transportation, 42: 257. "The 'Hensher equation' is a prominent method for valuing the benefits of VTTS.' Sanctioned by UK, Holland, Sweden and Norway Governments. There have been papers written by others on the Hensher Formula

2. Hensher, D.A. and Wang, B. (2016) Productivity foregone and leisure time corrections of the value of business travel time savings for land passenger transport in Australia, (Presented at the 2015 Australasian Transport Research Forum (ATRF), Sydney). Work commissioned in 2014 to develop a practical application for use by TfNSW.

3. Hensher, D.A. and Greene, W.H. (2003) The Mixed Logit Model: The State of Practice, Transportation, 30 (2), May 133-176. 1542 citations as of May 2018; the most cited paper in this journal.

4. Hensher, D.A. and Goodwin, P.B. (2004) Using values of travel time savings for toll roads: avoiding some common errors, Transport Policy Vol 11, No.2, pp 171-181

5. Hensher, D.A., Rose, J.M., Ortuzar, J. deDios, and Rizzi, L. (2009) Estimating the willingness to pay and value of risk reduction for car occupants in the road environment, Transportation Research Part A, 43(7), 692-707. This paper is basis of research that resulted in a revision upwards of a road fatality from $1.5m to $6m.

6. Hensher, D.A., Greene, W.H. and Li, Z. (2011) Embedding Risk Attitude and Decisions Weights in Non-linear Logit to accommodate Time Variability in the Value of Expected Travel Time Savings, Transportation Research Part B 45, 954-972. Major breakthrough in integrating extended expected utility theory into a random utility framework.

7. Hensher, D.A. (2006) How do Respondents Process Stated Choice Experiments? – Attribute consideration under varying information load, Journal of Applied Econometrics, 21, 861-878. Paper by Hensher that demonstrates the importance of attribute relevancy in contrast to the dominant focus in stated choice analysis on choice complexity.

8. Hensher, D.A., Ho, C. and Liu, W. (2016) How much is too much for tolled road users: toll saturation and the implications for car commuter value of travel time savings? Transportation Research Part A, 94, 604-21. (This paper has generated extensive media interest – newspapers, radio and TV).

9. Hensher, D.A., Rose, J.M. and Greene, W.H, (2005 and 2015, Second edition) Applied Choice Analysis, Second Edition, Cambridge University Press, Cambridge, (Major revision in 2015 with almost totally new material), 1188 pp. Over 3000 sales to date and over 3500 citations to date.

# Additional impact indicator information

**Additional impact indicator information**

*(Provide information about any indicators not captured above that are relevant to the impact study, for example return on investment, jobs created, improvements in quality of life years (QALYs). Additional indicators should be quantitative in nature and include:*
*- name of indicator (100 characters)*
*- data for indicator (200 characters)*
*- brief description of indicator and how it is calculated (300 characters).)*

Name

Margin (Return on Investment Assessment) resolution in bus contract negotiations in Sydney

Indicator Data

TfNSW promoted 6% and the operators over 20%. Based on evidence related to risk in a similar setting, Professor Hensher identified common ground – a range of 11-13% when the operator owns all assets.

Indicator Description

TfNSW and private bus operators reached a stalemate on the mark up on the cost of bus contracts. Professor Hensher helped them find common ground.

Name

Attribute Non-Attendance (ANA) Processing and Heuristics in Choice Analysis used in sector practice

Indicator Data

Over 100 environmental, health and energy sector studies have adopted ANA in estimating stated choice models.

Indicator Description

This accepts that features such as comfort and running costs may not be important in choice making. WTP estimates have now been adjusted in practice impacting estimates of VTTS, VoR etc.