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Accounting for the social benefits of regional transport investments – A case study from the Great Western Highway Upgrade Program

Lee Jollow[1], Kapil Kulkarni[2]

[1]RPS National Lead Economics [2] NSW Lead Economics, Level 13, 255 Pitt St Sydney NSW 2000

Email for correspondence: lee.jollow@rpsgroup.com.au

Abstract

Regional economic development is an increasing focus of government policy with regional transport investment often targeted at a broad range of social, tourism, industry, resilience and environmental benefits. However, current economic appraisal techniques for business cases focus on conventional transport benefits, which may disadvantage regional projects with lower population densities than urban areas competing for funding. A more comprehensive approach to benefit estimation is needed which adapts existing techniques from other social infrastructure sectors. This paper presents an expanded benefit framework for regional transport projects, case studies of transport-induced health and education ('human capital') benefits estimated for the Great Western Highway Upgrade Program, and an overview of UK Social Bank willingness to pay estimates for improved social outcomes. The case studies demonstrate that the benefits are likely to be material to the investment decision. These emerging benefit estimation techniques need to be further refined and embedded in practitioner guidelines for economic appraisal and business cases so that they are given sufficient weight in investment decisions.

1.Introduction

Economic appraisal techniques in the transport sector have progressed significantly over the last 20 to 30 years in line with advances in computing power, which have increased the sophistication of transport demand models. As a consequence, there are well established approaches to quantifying transport benefits in an economic appraisal informed by state, national and international guidelines. This framework has generally been sufficient for urban transport projects over this period, particularly where these urban transport projects are located in areas with relatively high population density or forecast growth, and they address capacity pinch-points in peak commuting periods.

Table 1: Transport benefits with established approaches to quantification in an economic appraisal

Category	Quantifiable benefits
Transport users	• Travel time savings from increased travel speed, reduced stops or reduced distance travelled. • Travel time reliability from reduced variability in travel times. • Reduced vehicle operating costs from increased travel speed, reduced stops or reduced distance travelled. • Increased amenity/willingness to pay for higher quality vehicles or stops/stations.
Transport network	• Reduced crowding on other transport modes. • Reduced congestion for remaining road users. • Avoided network operating and investment costs from rationalisation of other routes/modes.

Category	Quantifiable benefits
	• Improved resilience to incidents from additional lanes/tracks or alternative routes.
Community	• Improved safety and reduced noise and urban separation from reduced car use. • Health benefits from walking and cycling to stops/stations. • Increased amenity/willingness to pay from improved quality of the pedestrian environment.
Environment	• Reduced air pollution, greenhouse gas emissions or water pollution from car use.
Wider economic benefits	• Increased productivity or agglomeration economies from increased knowledge sharing between businesses. • Increased labour supply from a reduction in commuting times.
Land use and urban renewal	• Land value uplift from rezoning or increased floor space ratios enabled by the transport investment. • Reduced costs of infrastructure to support investment in different locations. • Reduced greenhouse gas emissions from heating/cooling dwellings with a more compact urban form.

In an urban context, the morning and evening commuter peaks account for around 60 per cent of daily trips[1] so benefits during these periods tend to be multiplied by the relatively large number of users and exponential relationship between transport volumes and costs (for example, congestion or public transport crowding). By contrast, regional[2] transport projects may support a wider range of trip purposes (that is, a less significant commuting task) with lower population density and limited alternative transport options. As a result, transport connectivity is often a more important consideration than capacity; or capacity constraints occur outside traditional commuting peak periods (for example, during peak tourism periods or natural disasters such as bushfires or floods). Further, regional transport is quite often an enabler to achieve a range of broader social and economic development objectives beyond addressing congestion, crowding and capacity constraints.

There are established techniques from social infrastructure sectors and overseas, which may be adapted to address these current gaps in the assessment of regional transport projects. The remainder of this paper sets out a regional and social benefit framework for consideration in regional transport projects and includes case studies demonstrating the potential significance of these benefits. Further refinement of these approaches is likely to be required and some potential next steps for guideline development have also been identified.

2. The importance of regions

Regional areas are already significant in terms of their scale and diversity, accommodating 9 million people, employing around one third of Australia's workforce and producing around 40 per cent of the national economic output.[3] Further, regional Australia has the highest national productivity in over a third of industries.[4]

Regions also play an important role in taking the pressure off our cities, where infrastructure required to support growth may be more expensive to retrofit into a dense urban environment

[1] RPS calculation based on expansion factors in TfNSW (2020), p50.

[2] Regional and remote areas are defined consistently with the Australian Bureau of Statistics (ABS) remoteness classifications, available at: https://www.abs.gov.au/websitedbs/d3310114.nsf/home/remoteness+structure, accessed 22nd September 2021.

[3] Parliament of the Commonwealth of Australia (2018) 'Regions at the Ready: Investing in Australia's Future', p33.

[4] Regional Institute Australia, 'The Economic Contribution of Regions to Australia's Prosperity, available at: http://www.regionalaustralia.org.au/wp-content/uploads/Talking-Point-The-economic-contribution-of-regions-to-Australia%E2%80%99s-prosperity_to-send.pdf; accessed 24th July 2021.

and there may be more affordable housing choices or improved lifestyle and amenity. For example, urban development may require transport infrastructure to be delivered in tunnel rather than at surface. Further, while in-fill development in cities may be able to take advantage of latent capacity in existing networks to support growth (e.g. utilities, schools, universities, hospitals etc.); when these networks do reach capacity this can result in a step-change in costs to support urban growth. Regional areas may also provide an advantage in terms of lower land values. In addition to contributing to lower infrastructure costs, this may provide opportunities to support affordable housing choices as well as improved lifestyle and amenity (for example, from increased green space), particularly for younger people. COVID-19 has seen record net migration out of cities[5].

2.1. Regional social disadvantage

Despite a number of natural advantages and endowments, the distribution of wealth is a significant challenge in regional areas which also face the greatest levels of social disadvantage. Evidence shows that a lack of sufficient transport infrastructure can be a significant barrier to social inclusion, or people's ability to participate adequately in society including education, employment, public service, social and recreational activities[6]. This is of particular concern in regional areas which have:

- **Poorer health outcomes:** According to the Australian Institute of Health and Welfare (AIHW) life expectancy is 11 years lower in very remote areas than major cities, with a 40% higher mortality rate[7]. A recent study also puts rates of suicide in regional areas 50% higher than in the capital cities[8].
- **Lower levels of education:** More than 20% fewer people finish Year 12 or receive a bachelor's degree compared to the major cities[9].
- **Higher levels of long-term unemployment:** According to the 2016 Australian Census, 5.6% fewer people participate in the labour force in regional Australia compared to the major cities[10].
- **Homelessness**: According to the Australian Institute of Health and Welfare, nearly 40% of rough sleeping in Australia occurs outside the major cities[11].

2.2. Regional infrastructure gap

Social disadvantage is further reinforced by an acknowledged infrastructure gap between our cities and regions[12]. For example, in response to the 2019 Australian Infrastructure Audit, Infrastructure Australia CEO Romilly Madew stated:

> *In some parts of the country, the provision of infrastructure services remains below what is acceptable for a highly developed nation that prides itself on a fair go for all…The most pervasive issue in these areas is connectivity, in both a physical and a digital sense. Access to telecommunications and transport links are key factors influencing business decisions to invest in regional areas. Australia's mobile footprint*

[5] ABC News (2 February 2021), 'ABS data confirms a city exodus during COVID, with biggest internal migration loss on record'

[6] See, for example, 2003 research from the UK Government's Social Exclusion Unit cited in Transport for NSW (March 2016) 'Principles and Guidelines for Economic Appraisal of Transport Initiatives and Investment', p95.

[7] Australian Institute of Health and Welfare (2019).

[8] Fitzpatrick, Brew, Read, Inder, Hayes and Perkins (2019) 'Rethinking Suicide in Rural Australia: A study Protocol for Examining and Applying Knowledge of the Social Determinants to Improve Prevention in Non-Indigenous Populations', International Journal of Environmental Research and Public Health.

[9] Commonwealth of Australia (2019) 'National Regional, Rural and Remote Tertiary Education Strategy'.

10 .idcommunity, 'Regional Australia Employment Status', available at: https://profile.id.com.au/australia/employment-status?WebID=245, accessed 20th May 2021.

[11] Australian Institute of Health and Welfare (2018) 'Sleeping Rough – A Profile of Specialist Homelessness Services Clients', p13.

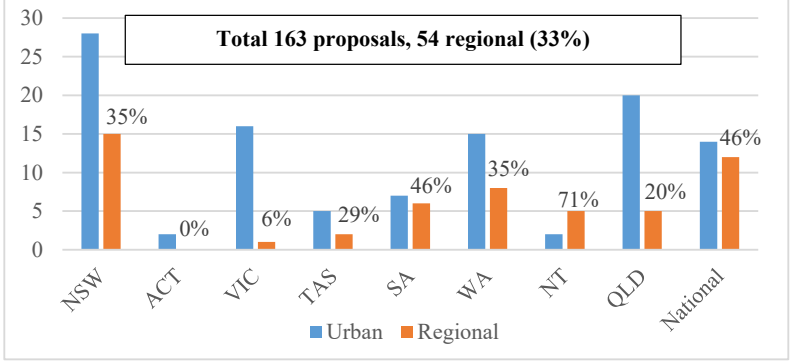
[12] CEDA (2019) 'Addressing the infrastructure gap between our cities and regions'

only covers one-third of its landmass – and poor mobile reception and unreliable broadband limit people's capacity to communicate, innovate and embrace data-reliant technologies.

Figure 1: Analysis of the proportion of regional initiatives on the Infrastructure Priority List 2021

Analysis of the Infrastructure Priority List 2021 shows that, of the 163 proposals included, only 54 (33%) of these were in regional and remote areas.

This is despite relatively high regional splits for Northern Territory (71%), South Australia (46%) and national initiatives (46%).



Source: RPS analysis of Infrastructure Priority List 2021; available at: https://www.infrastructureaustralia.gov.au/search-priority-list-map

3. A regional economic and social benefit framework

This paper presents a regional economic and social benefit framework for application to regional transport projects, which often address broader development objectives (Table 2):

- Supporting the competitiveness of primary industries such as agriculture or mining or avoiding the decline of critical local industries which may employ a large proportion of the regional population or make a significant contribution to exports.
- Attracting people to relocate to regional locations to take the pressure of our cities where land prices (and the opportunity cost of land) may be higher, and infrastructure may be more expensive to retrofit into a brownfield environment.
- Attracting additional tourism to benefit local businesses providing services such as accommodation, food or tours.
- Improving resilience to natural disasters and extreme weather events such as flooding and bushfires.
- Addressing social disadvantage by improving access to healthcare, education and affordable housing.

Key differences relative to conventional transport appraisal approaches include the adaptation of benefit estimation approaches from other social infrastructure sectors (e.g. health and education) and inclusion of social benefits based on the well-being of an individual (that is, willingness to pay for improved social outcomes based on the UK Social Value Bank) as outlined in more detail in the following sections. According to Social Value International[13]:

> *Social value is the quantification of the relative importance that people place on the changes they experience in their lives. Some, but not all of this value is captured in market prices. It is important to consider and measure this social value from the perspective of those affected.*

Quantification of these benefits would need to comply with normal principles of economic appraisal including defining the problems to be addressed, incremental comparison to a Base Case representing continuation of the status quo and avoiding double counting or financial

[13] Social Value International, 'What is social value?', available at: https://socialvalueint.org/what-is-social-value/, accessed 6 July 2021.

transfers. Although developed for a regional context, these benefits may also be relevant to urban projects if the same types of accessibility and social challenges can be demonstrated[14].

Table 2: Regional economic and social benefit framework for economic appraisal

Category	Benefit	Importance to regions	Measurement considerations
Industry	Productivity uplift and export expansion	A reduction in transport and logistics costs would increase productivity and induce greater exports, all else equal.	The appraisal should consider historic growth, comparative advantage and the potential redistribution of resources from elsewhere in NSW.
	Avoided decline of critical local industries	The decline or collapse of a local industry can result in long-term unemployment, retraining costs and stranded assets.	The appraisal should consider the risk of decline/collapse, industry structure and the mobility of factors of production.
Tourism	Induced tourism	Tourism can comprise a large proportion of regional economic activity, not only in terms of direct tourism focused businesses but also the broader supply chain.	Tourism benefits are captured through producer surplus, or consumer surplus for domestic tourists. The appraisal should consider the potential redistribution of tourist activity in other parts of the state/country.
	Tourism-related transport benefits	Peak congestion on transport infrastructure occurs at different times/seasons.	The appraisal should use adjusted (higher) expansion factors based on local data to reflect that a greater proportion of tourist trips occur outside traditional commuter peak periods.
Infrastructure	Avoided infrastructure costs	Greater availability of land in regional locations and opportunities to construct at surface may reduce costs compared to urban locations.	Dependent on attracting people away from urban areas. However, population supporting infrastructure such as utilities may be more expensive in greenfield locations.
	Resilience	Regional communities are susceptible to natural disasters such as bushfires and flooding and other incidents. This is because there are relatively limited alternative transport options to avoid natural hazards and limited assets to reduce their impacts (e.g. break-walls).	Probability weight resilience benefits based on the frequency and consequence of events including closure and maintenance (e.g. cost of congestion or crowding when there is an incident that closes one or more lanes). It is also necessary to reduce the core benefit proportionally (i.e. based on the probability of no natural disaster or incident occurring).
Social	Reduced health costs (physical and mental)	Transport infrastructure enables better access to health services, facilitating earlier intervention and better treatment outcomes. It also reduces the mental health costs of social exclusion.	The appraisal needs to consider the role of transport infrastructure compared to other factors that contribute to health and inclusion outcomes.
	Improved human capital	Transport infrastructure enables better access to education and employment services, improving the productivity and employment prospects of the labour force.	The appraisal should establish a meaningful counterfactual and focus on improvements in structural unemployment rather than cyclical unemployment.

[14] Available evidence shows that urban areas tend to have significantly lower levels of social disadvantage (e.g. Australian Bureau of Statistics Socio-economic Indices for Areas), shorter distances to access healthcare and higher education, higher levels of healthcare visitation (e.g. Australian Institute of Health and Welfare) and higher levels of enrolment in higher education (e.g. Census).

Category	Benefit	Importance to regions	Measurement considerations
	Improved housing supply and amenity	Connecting cities to regions provides more affordable housing options for the population, providing improved amenity and quality of life for migrants who would have otherwise remained in the city due to the lack of connectivity.	The appraisal should include both benefits and offsetting costs of regional housing. Offsetting costs include greater pressures on local infrastructure and higher emissions from heating and cooling larger dwellings.

4. Great Western Highway Upgrade Program case studies

The Great Western Highway acts as the key NSW road transport route across and along the Great Dividing Range for all vehicles, including emergency and essential services, local commuters, through commuters, tourists and freight. The Great Western Highway is also part of the National Land Transport Network and is a crucial freight transport corridor from the Central West to Sydney and the Blue Mountains.

The Great Western Highway Upgrade Program (GWHUP) proposes to deliver 34 kilometres of four lane carriageway between Katoomba and Lithgow including a tunnel. The upgrades, once completed, will reduce congestion and provide safer, more efficient and reliable journeys for everyone travelling in, around and through the Blue Mountains, and better connect communities in the Central West.

The corridor includes four Local Government Areas (LGA): Blue Mountains, Oberon, Lithgow and Bathurst. There are a diverse range of customers using the corridor including through traffic from the Central West and Orana Region (e.g. agricultural road freight); local traffic from communities such as Katoomba, Blackheath, Mt Victoria and Lithgow; and a range of intrastate, interstate and international tourists. Its transport demand profile is different to typical urban projects without a pronounced weekday commuting peak and the busiest periods occurring on Friday evenings, weekends, school holidays and special events. There are frequently significant delays and unreliability during these periods particularly following an incident. This is reflected in the objectives and key benefits from the GWHUP summarised in the table below.

Table 3: Great Western Highway Upgrade Program objectives and key benefits

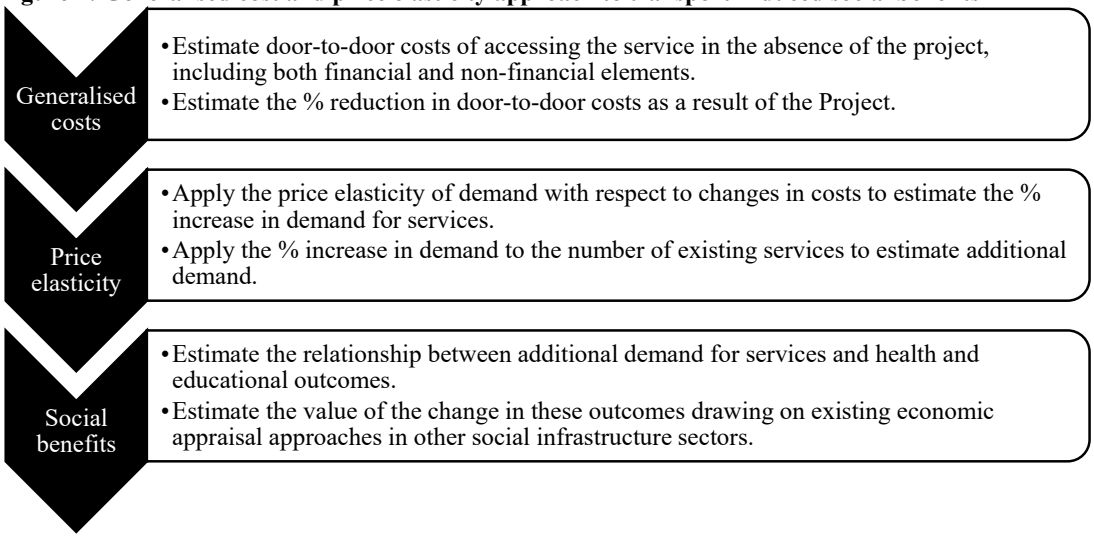
Objectives	Key benefits
Improve economic development, productivity and freight accessibility in and through the Blue Mountains, Central West and Orana regions.	• Freight vehicle travel time savings, reliability and vehicle operating cost savings. • Enable high productivity freight vehicles. • Induced freight (production and exports). • Induced tourism (net visitor spend).
Improve transport network performance and efficiency along the corridor between Katoomba and Lithgow to meet the needs of all our customers.	• Private vehicle travel time savings, reliability and vehicle operating cost savings. • Resilience to natural disasters and other incidents.
Improve the overall safety of the corridor for all transport users between Katoomba and Lithgow.	• Avoided crashes. • Improved emergency services access.
Enhance the liveability and be sensitive to unique environmental and cultural assets along the corridor between Katoomba and Lithgow	• Community amenity from bypasses. • Reduced vehicle emissions. • Improved access to healthcare and education.

Objectives	Key benefits
	• Improved National Park access.
Provide a value for money, sustainable and deliverable solution.	• Avoided road maintenance costs. • Sustainability in design.

The Blue Mountains are a significant tourism attraction with a World Heritage Listing. However, in spite of the opportunities that this creates there are significant areas of social disadvantage within the corridor. For example, Lithgow's socio-economic index score places it within the bottom 20% of the country (2016)[15]. There are currently 14.5 more avoidable deaths per year in the Katoomba to Lithgow corridor than the NSW average (2018)[16] and 790 fewer university enrolments per year than the Greater Sydney average (2016)[17]. Each avoidable death costs society around $8 million ($2020/21)[18] while each university graduate would contribute an additional $318,000 in lifetime productivity to the economy ($2020/21, present value) [19].

The case studies show that the Great Western Highway Upgrade Program improves health and education outcomes by significantly reducing the travel costs of accessing health care and higher education, and therefore increasing their demand. This is based on a generalised cost and price elasticity of demand approach that is already applied in transport economic appraisal (e.g. strategic transport demand modelling to estimate travel time savings, induced freight benefits and induced tourism benefits). Key steps in this approach are outlined in the figure below.

Figure 2: Generalised cost and price elasticity approach to transport-induced social benefits



4.1. Transport-induced health benefits

The generalised cost approach outlined in Figure 2 was used to estimate the health benefits induced by the GWHUP, expressed as the avoided mortalities resulting from more frequent and earlier access to health services. The summary results are as follows based on key assumptions set out in Table 4:

[15] ABS (2018) '2033.0.55.001 - Census of Population and Housing: Socio-Economic Indexes for Areas (SEIFA), Australia, 2016'

[16] NSW Government, HealthStats NSW, available at: http://www.healthstats.nsw.gov.au/ , accessed 6th July 2021.

[17] ABS (2017) '2016 Census'.

[18] TfNSW (2020) 'Economic Parameter Values'

[19] RPS calculation based on commencing a university degree at age 19, un-subsidised (i.e. resource) costs of a Bachelor degree taking 3 years, the increase in Average Weekly Earnings (ABS Census 2016), average retirement age of 65 years and a 7% discount rate (TfNSW 2020). University fees and commonwealth contribution based on Universities Australia (2019) 'Higher education: Facts and figures'

- An average travel time reduction of over 13 minutes per trip (2036 average weekday)[20] is estimated to lead to a 10% reduction in transport costs to access healthcare and a 3% reduction in total generalised costs. In turn, this is estimated to result in an 1% increase in demand for health services in the four LGAs (from 6.0 per person to 6.059 per person) or an additional 8,600 health services per year across the corridor population (145,000 in 2016). As a result, there are estimated to be 6 fewer avoidable deaths per year. Over the 30-year period from full opening of the program in 2030/31 to 2059/60, the aggregate net health benefit from the GWHUP is estimated to be $450 million (present value, 7% discount rate, 30 years).
- If the appraisal period were increased to 50 years to be more consistent with the asset life for pavement (50 years) and tunnels (100 years) then the estimated health benefit would increase to $493 million (present value, 7% discount rate, 50 years).

Table 4: Sources used to estimate transport-induced health benefits

Steps	Source(s) or approach used	Notes
Generalised private cost of healthcare	• McGrail (2015) – average distance to regional general practitioners. • RPS analysis of Google Maps, 2021 – distances and times to hospitals in the corridor. • Transport for NSW (2020) – value of time and vehicle operating costs. • Medicare Benefits Schedule (MBS) 2019-20 – average out of pocket expenses for in-hospital and out-of-hospital.	• Travel cost based on weighted average distance and travel times to GPs and hospitals. • The MBS provides estimates of the proportion of in-hospital and out-of-hospital services, which have been used to weight the proportion of GP versus hospital services respectively. • Generalised costs include average wait time, consultation time and out-of-pocket expenses.
Base Case demand for health services	• AIHW (2019) – health services per capita by remoteness.	• Assumes health services per capita for inner regional areas.
Base Case avoidable fatalities	• HealthStats NSW – avoidable mortality rates by Local Health District. • ABS Census (2016) – Population by LGA • Department of Planning, Industry and Environment (DPIE) (2020) – population forecasts by LGA.	• Assumes avoidable fatalities per 100,000 population for Nepean Blue Mountains Local Health District. • Applied to population forecasts for 4 LGAs in the GWHUP corridor.
Reduction in travel time and vehicle operating costs with GWHUP	• GWHUP Strategic Business Case – Transport demand modelling of average weekday travel time saving on the Great Western Highway between Katoomba and Lithgow. • TfNSW (2020) – value of travel time and vehicle operating costs.	• Reduction in travel times based on the average weekday travel time saving on the Great Western Highway corridor, adjusted for the proportion of the upgraded corridor that would be used in the journey. • Calculate percentage reduction in generalised costs of health services.
Price elasticity of demand for health services	• McRae (2008) cited in Scott (2015) – price elasticity of health services with respect to price.	• Apply price elasticity of demand to the percentage reduction in generalised costs of health services to estimate percentage increase in demand for health services.

[20] Travel time savings based on Strategic Business Case modelling of a trip travelling the full length of the Katoomba to Lithgow corridor. This has been adjusted in line with the proportion of the upgraded Great Western Highway corridor that would be used in the journey.

Steps	Source(s) or approach used	Notes
		• Apply to health services per person to estimate the increase in demand for health services.
Relationship between demand for health services and avoidable mortalities	• RPS calculation based on AIHW (2019) – reduction in mortality rate for every unit increase in health services per person based on analysis of health data by degree of remoteness. • ABS Census (2016) – Population by LGA.	• Estimate the relationship between number of health services per capita and age-standardised mortality rate. • Apply to estimated increase in health services per person. • Apply reduction in mortality rate to corridor population.
Value of a statistical life	• TFNSW (2020) – value of statistical life based on the recommended 'inclusive willingness to pay' approach.	• Applied to difference between Base Case and Project Case fatalities per year.
Other assumptions	• TfNSW (2020) – social discount rate of 7%- and 30-year appraisal period.	• Used to discount future costs and benefits to their present value assuming construction is complete in 2029/30.

4.2. Transport-induced education (human capital) benefits

The same generalised cost approach was used to estimate the transport-induced education (human capital) benefits from the GWHUP. The summary results are as follows based on key assumptions set out in Table 5:

- An average travel time reduction of over 13 minutes per trip (2036 average weekday)[21] is estimated to lead to an 8% reduction in transport costs to access higher education and a 1.5% reduction in total generalised costs.
- In turn, this is estimated to result in an 0.8% increase in demand for higher education in the four LGAs (from 5,945 to 5,992 total university enrolments) or an additional 13.5 graduates per year across the corridor population.
- The aggregate net education (human capital) benefit from the GWHUP is estimated to be $41 million (present value, 7% discount rate) over 30 years, and $45 million (present value, 7% discount rate) over 50 years.

Table 5: Sources used to estimate transport-induced education (human capital) benefits

Steps	Source(s) or approach used	Notes
Generalised private cost of education	• RPS analysis of Google Maps, 2021 – distances and times to universities in the corridor. • TfNSW (2020) – value of time and vehicle operating costs • Assumes 40 hours of learning time per week for a full-time student. • Universities Australia (2019) – student and Commonwealth contributions to university fees[22]	• Travel cost based on distance and travel times to universities. • Generalised private cost of education also includes learning time and student contribution to university fees • Assumes a distribution of Bachelor degree enrolments by discipline consistent with the Australian average

[21] Travel time savings based on a trip travelling the full length of the Katoomba to Lithgow corridor. This has been adjusted in line with the proportion of the upgraded Great Western Highway corridor that would be used in the journey.

[22] Applied to Australian university enrolment by field of education from Australian Government Department of Education, Skills and Employment, 'uCube', available at: http://highereducationstatistics.education.gov.au/, accessed 21st July 2021.

Steps	Source(s) or approach used	Notes
Base Case enrolments	• ABS 2016 Census – university enrolments and population by LGA. • Department of Planning, Industry and Environment (DPIE) (2020) – population forecasts by LGA.	• Estimated as the sum of Bachelor degree enrolments across the four LGAs
Reduction in travel time and vehicle operating costs with GWHUP	• TfNSW (2020) – value of travel time and vehicle operating costs.	• Reduction in travel times based on proportion of GWHUP corridor used to access universities applied to the average weekday travel time saving • Calculated percentage reduction in generalised costs of higher education
Price elasticity of demand for tertiary education	• DAE (2011) – price elasticity of demand for Australian domestic students (subsidised) • Langelett et al (2015) – international price elasticity of demand (unsubsidised)	• Estimated as a weighted average of the two sources[23] • Applied to percentage reduction in generalised costs of higher education
Productivity increase through improved human capital	• ABS 2016 Census – University enrolments and population • ABS (2020) – Average Weekly Earnings	• Applied to additional graduates per year based on an assumed 3-year degree and average completion rate[24].
Other assumptions	• TfNSW (2020) – social discount rate of 7%- and 30-year appraisal period.	• Used to discount future costs and benefits to their present value assuming construction is complete in 2029/30.

5. Other potential social value measures

Beyond health and education benefits, there are likely to be many other social outcomes which could be valued using existing approaches and sources (e.g. willingness to pay). For example, the UK Social Value Bank has developed a range of social values linked to individual wellbeing improvements as evidenced by survey outcomes chich can potentially be tracked over time.

The table below presents a selection of social values which have been converted from UK pounds to Australian Dollars based on a 30- year average exchange rate (0.48)[25]. As an example of how this may operate in practice, average earnings of employees are often used as evidence of the value of an additional or more productive job (for example, travel time savings). However, a job may have additional value to an individual or community because that person has moved from unemployment to full time employment ($43,000) or to a job with greater security ($28,800). As a result, that person may no longer be burdened by debt ($30,300) or no longer have difficulty paying for housing ($18,200).

[23] DAE (2011) estimate an elasticity of -0.026 applying to the fee for HECS eligible courses in Australia (now HELP), which is relatively low (inelastic) compared to international elasticity estimates obtained through literature review (e.g. see Kiiashko, 2016). It is hypothesised that this Australian estimate is relatively low as the price signal of a higher or lower fee is effectively dampened by HECS (now HELP), which allows students to repay loans without interest and only when the student earns a wage above a specified threshold. It is further hypothesised that students are likely to be more responsive to cost changes incurred fully and immediately (e.g. vehicle operating costs). The calculation therefore uses a weighted average of DAE (2011) and Langelett et al (2015), who estimate a higher elasticity of -0.68, with the weight applied to the DAE (2011) estimate being the proportion of the generalised cost that is the student fee contribution.

[24] Grattan Institute (2019) 'Are international students passing university courses at the same rate as domestic students', available at: https://www.gov.uk/government/publications/social-value-act-information-and-resources/social-value-act-information-and-resources, accessed 21st July 2021.

[25] OFX, available at: https://www.ofx.com/en-au/forex-news/historical-exchange-rates/aud/gbp/, accessed 14th July 2021

Table 6: A selection of social value measures based on the UK Social Value Bank ($AUD[26])

Theme	Social benefit and supporting evidence	Value
Employment	Unemployment to full time employment	$43,300
	Job security changes from 'not satisfied' to 'somewhat satisfied' or greater	$28,800
	Received an apprenticeship	$5,600
Crime	Vandalism reduces from a 'fairly big' to a 'not very big' problem	$10,000
	Crime reduces so that is 'not at all' a worry	$31,400
	Anti-social behaviour reduces from 'high' to 'low'	$15,900
Community	Litter reduces from a 'fairly big' problem to 'not very big	$8,800
	Feeling of community belonging increases from 'agree' to 'strongly agree'	$9,300
	Ability to rely on family increases from 'somewhat' to 'a lot' or greater	$16,800
	Feeling empowered (in control of life) 'sometimes' to 'often' or greater	$51,066
Health	Depression of anxiety no longer suffered	$97,200
	Overall health increases from 'fair' or lower to 'good' or greater	$53,200
Housing	Rough sleeping to temporary accommodation	$50,900
	Temporary housing to secure accommodation	$16,700
	No longer have difficulty in paying for housing	$18,200
	Debt burden reduces from 'heavy' to 'somewhat' or lower	$30,300

6. Conclusion and next steps

This paper has sought to demonstrate that there are existing approaches to economic appraisal which can be adapted to value regional economic and social benefits in a way that is consistent with the underlying principles of cost benefit analysis. This includes generalised cost and price elasticity of demand approaches from the transport sector, tourism and other social infrastructure sectors such as education and health and willingness to pay for improved well-being.

Through case studies of transport-induced health and education (human capital) benefits from the GWHUP, as well as values from the UK Social Value Bank, this paper has demonstrated that these benefits are material and have the potential to be significant. For example, they could contribute more than $490 million (present value, 7% discount rate, 30 years) over the lifecycle of a major regional road investment[27].

The debate moving forward, therefore, should not be whether these benefits should be considered and valued, but rather the appropriate assumptions and treatments and how to reach a level of consensus to embed these in cost benefit analysis guidelines. In order to facilitate this a number of next steps have been identified to further refine and test these initial estimates including:

- Canvassing alternative studies on the price elasticity of demand, including the potential development of tailored values to be applied to generalised costs rather than out-of-pocket expenses.
- Considering how assumptions might change in areas with different degrees of remoteness (that is, inner regional, outer regional or remote), including more detailed analysis of the relationship between avoidable mortality rates and health services per person.

[26] Values have been converted from UK Pounds to Australian Dollars based on a 30-year average exchange rate of 0.48. These are general values that can be applied to both urban and regional areas ('unknown location') and include flow-on health benefits ('health top-up') and an adjustment for outcomes that would have been achieved without the intervention ('deadweight'). Where surveys are required for supporting evidence the table presents the 'tipping point' where the benefit can be attributed.

[27] Sum of transport-induced health and education (human capital) benefits from the GWHUP.

- Expanding the types of health benefits measured beyond mortality, for example, to also include morbidity (that is, disability adjusted life years) or willingness to pay for improved health and well-being.
- Expanding higher education benefits to also consider TAFE and post-graduate study, including more detailed data on duration of study.

In the interim, there is also the need for state, territory and national agencies reviewing economic appraisals to be more accepting of alternative approaches that are not included in current guidelines but are conceptually sound and directly linked to the objectives of the initiative. Otherwise, investment outcomes will continue to be skewed by including all the costs for these sorts of regional and social initiatives but only a fraction of the benefits.

7. References

1. Australian Bureau of Statistics (ABS) (2017) '2008.0 - Census of Population and Housing: Nature and Content, Australia 2016 '
2. Australian Government Department of Health (2019) 'Medicare Benefit Scheme statistics 2018-19'.
3. Australian Institute of Health and Welfare (2019) 'Rural & remote health', available at: https://www.aihw.gov.au/reports/rural-remote-australians/rural-remote-health/contents/access-to-health-care, accessed 5th July 2021.
4. Deloitte Access Economics (DAE) (2011) 'The impact of changes to student contribution levels and repayment thresholds on the demand for higher education'
5. HACT, 'The UK Social Value Bank', available at: https://www.hact.org.uk/uk-social-value-bank, accessed 14th July 2021.
6. Langelett, G., Chang, K., Ola' Akinfenwa, S., Jorgensen, N. and Bhattarai, K. (2015)' Elasticity of demand for tuition fees at an institution of higher education', Journal of Higher Education Policy and Management, Volume 37, Issue 1.
7. McGrail, M. (2015) 'Accessing doctors at times of need–measuring the distance tolerance of rural residents for health-related travel', BMC Health Services Research.
8. McRae, I. (2008) 'Doctors at work: determinants of supply and demand in the Australian GP market', PhD Thesis, Australian National University.
9. NSW Government, 'HealthStats NSW', available at: http://www.healthstats.nsw.gov.au/, accessed 6th July 2021.
10. NSW Government Department of Planning, Industry and Environment (2020) '2019 population, housing and implied dwelling projections by LGA (ASGS 19)', available at: https://www.planning.nsw.gov.au/Research-and-Demography/Population-projections/Projections, accessed 5th July 2021.
11. NSW Health (2018) 'Guide to Cost Benefit Analysis of Capital Health Projects'
12. Scott, A. (2015) 'The GP Co-payment: A Short Postmortem and a New Research Agenda on Medicare', University of Melbourne, Melbourne Institute Policy Briefs Series, Policy Brief No. 1/15.
13. Social Value International, 'What is social value?', available at: https://socialvalueint.org/what-is-social-value/, accessed 6 July 2021.
14. Universities Australia (2019) 'Higher education: Facts and figures'
15. Transport for NSW (2019) 'Cost-Benefit Analysis Guide'
16. Transport for NSW (2020) 'Economic parameter values'
17. Dawson, P. and Dixon, J. (2015) 'Alternative Approaches to Fee Flexibility: Towards a Third Way in Higher Education Reform in Australia', Victoria University Centre of Policy Studies.