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Economic contribution of Australia's toll roads

Report prepared for Transurban Limited

11 August 2015

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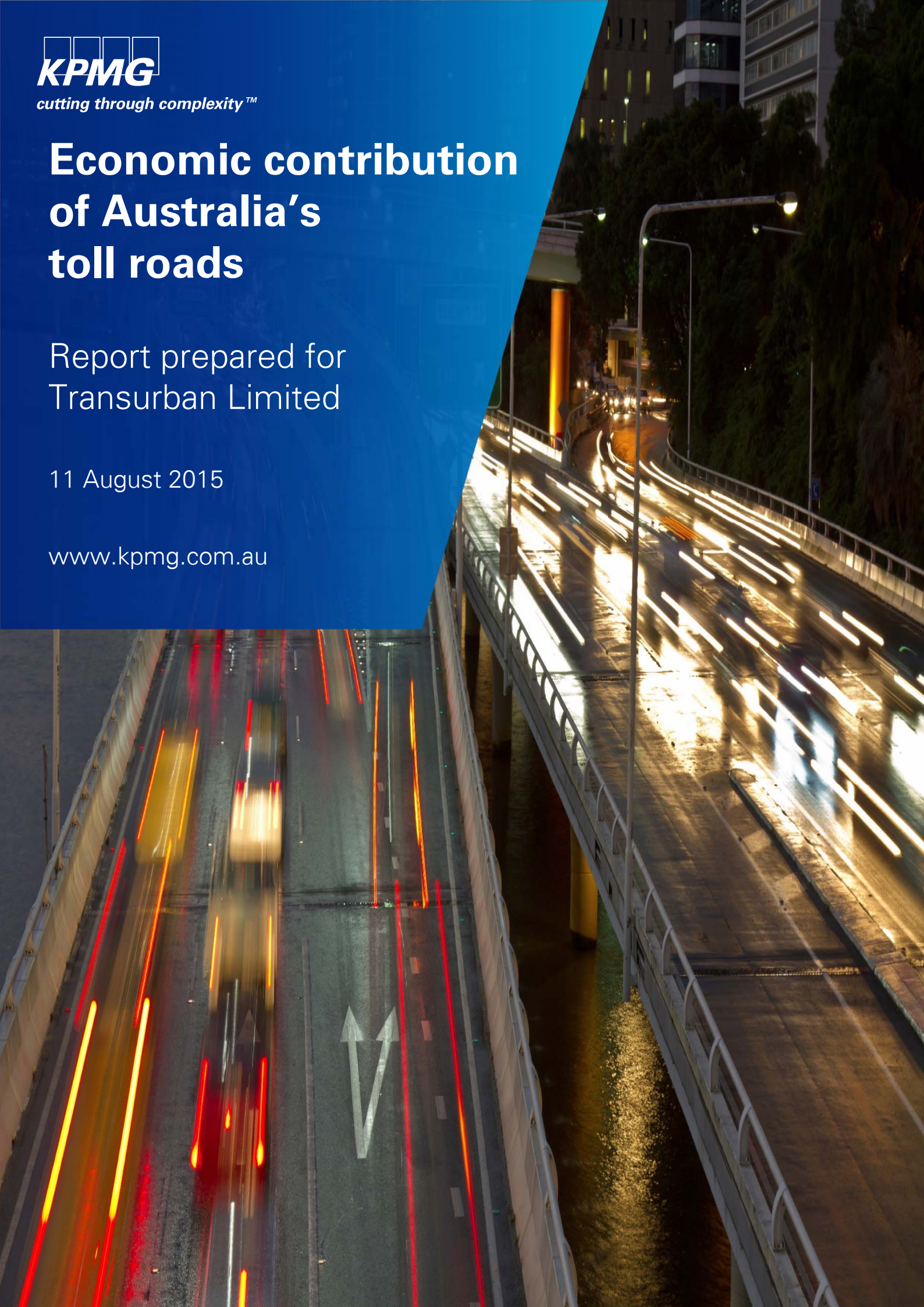

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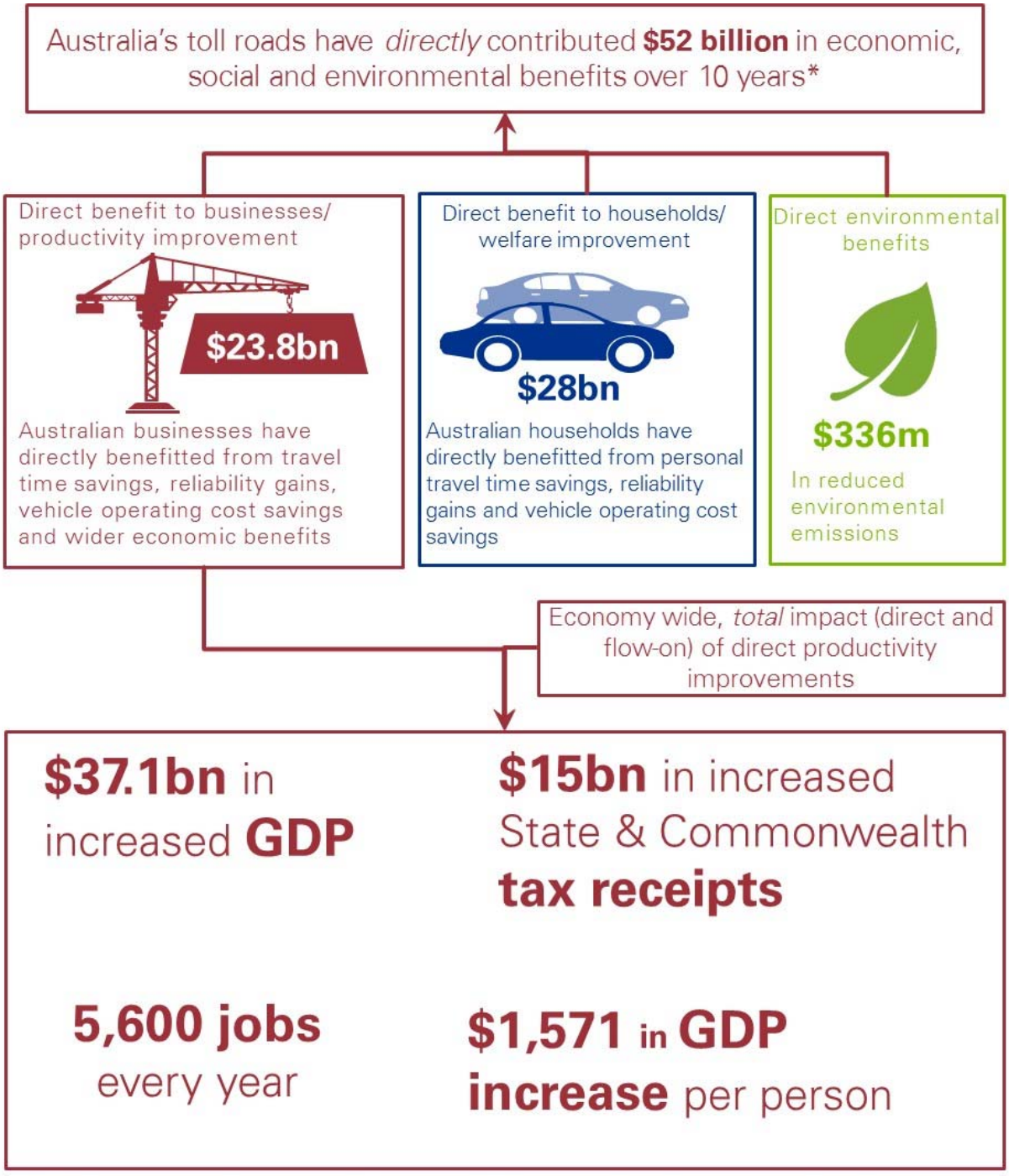
Executive Summary



* All $ values are reported in present value terms using Infrastructure Australia recommended real discount rate of 7 per cent, which equates to a nominal discount rate of 9.7 per cent.

An efficient transport network is critical to sustaining economic success in modern economies. Transport, together with urban form, facilitates physical mobility and enhances communities' access to a wide range of economic, social, cultural and recreational activities. It also provides businesses with access to other businesses and customers as well as the labour force – which are critical to the operation of an efficient and productive economy.

Australian cities are becoming increasingly congested, which is impacting our productivity and standard of living. Analysis of population and congestion levels demonstrates that ***users of roads in Australian cities, whilst having relatively smaller populations when compared to international counterparts, spend a disproportionately large amount of time in congestion.*** A recent audit of Australia's infrastructure[1] estimated that ***congestion in the largest capital cities in Australia costs $13.7bn per year, and is projected to grow to $53.3bn by 2031.***

Australia currently has 16 toll roads operating in the three most populous cities of Sydney, Melbourne and Brisbane. ***Implementing a toll on these roads has enabled infrastructure projects to be delivered earlier than they would have been under the government funded, no user charge traditional model***.

This report estimates the Total Economic Contribution (TEC) of the toll roads in Australia. The economic analysis demonstrates that ***annually Australian toll roads directly contribute approximately $7bn per year in economic, social and environmental benefits***. The estimated $7bn can be interpreted as the direct loss in benefit associated with delaying the delivery of these toll roads by every single year.

Figure 1: Annual direct economic benefits of toll roads in Australia

Source: KPMG analysis.

The analysis postulates that the absence of tolls would have resulted in the 16 toll roads currently operating in Australian cities being delayed by 10 years (central scenario). Sensitivity analysis has been undertaken for a scenario where the toll roads would have been delayed by at least five years (low scenario) and 30 years (high scenario).

[1] Infrastructure Australia, 2015, Australian Infrastructure Audit Report

Under the central scenario, the estimated annual benefits were extrapolated over 10 years and present value of the stream of benefits were derived using a 7 per cent real discount rate[2]. Analysis demonstrates that the ***conventional and wider economic benefits amount to approximately $52bn in present value terms over the 10 years***.

Approximately $24bn of this total benefit is estimated to be productivity enhancing, directly improving our standard of living. These estimates were then incorporated into a macroeconomic Computable General Equilibrium (CGE) model to assess the total economic contribution of the toll roads in Australia. The analysis found that ***Australia's GDP is higher by $37bn over 10 years (present value terms) due to this critical infrastructure***. This equates to an average ***increase in our standard of living by $1,570 per person as measured via real GDP per capita*** over a 10-year period (in present value terms).

Toll roads have directly and indirectly supported 5,600 jobs per year across Australia. The increased economic activity supported by toll roads has in turn ***improved the State and Commonwealth tax receipts by $15bn over 10 years (in present value terms), sufficient to fund the delivery of eight new major hospitals or 1,250 secondary colleges.***

Of the three States that currently have toll roads:

1 The greatest benefits are realised in Queensland, where three orbital toll roads – the Gateway Motorway, Gateway Extension Motorway and Logan Motorway – connect major employment nodes, and have largely 'shaped' Brisbane over the past 30 years;

2 The second greatest impact is experienced in New South Wales (NSW); and

3 The third greatest impact is experienced in Victoria.

The difference in benefit between NSW and Victoria is principally due to NSW having a higher number of route-kilometres of toll roads relative to Victoria.

The economic analysis undertaken in this report considers the accrual of benefits to users of the *toll roads only* (i.e. how much time and vehicle operating costs they save) but not the additional congestion that would be caused by these users if they had to use the non-tolled network. This shift would potentially result in (even greater) congestion in each city, causing travel patterns and land use to be significantly different. By not including these broader dis-benefits, our analysis is deemed highly conservative. Moreover, the traffic modelling data available to KPMG did not enable estimation of the full spectrum of environmental externalities as well as accident savings.

The estimated benefits of toll roads presented in this report are therefore considered highly conservative, and could be interpreted as the minimum level of benefits attributable to the toll roads.

[2] Assuming inflation of 2.5 per cent (the mid-point of Reserve Bank of Australia's consumer price index target of between 2 and 3 per cent), the 7 per cent real discount rate equates to a nominal discount rate of 9.7 per cent.

1. Introduction

1.1 Overview

Transport is a key enabler of the modern economy, underpinning the efficiency with which it operates. Transport, alongside urban form, is the biggest factor in our lived experience of cities. Road transport in particular facilitates a significant portion of our transport task, facilitating all urban freight, almost 70 per cent of all passenger trips and one-third of all intra and inter-state freight.[3]

Major road projects have long gestation periods, high capital costs and long payback periods. For this reason, Governments have historically delivered the majority of road projects in Australia, and have traditionally covered project costs through tax revenue, and occasionally user tolls. Revenue constraints faced by state and federal governments, a reluctance to further increase public debt and the current and projected growth in social, health, education and other service delivery expenditure, suggest that the traditional approach of publicly funded road infrastructure is becoming increasingly difficult. Recent rapid population growth has resulted in a material deterioration in congestion and is projected to further worsen.

Over the past two to three decades, Public Private Partnerships (PPPs) have emerged as one way to address the infrastructure delivery challenges facing Australian governments. In the transport sector, PPPs have typically taken the form of toll roads. The other (less common) PPP mechanism used to unlock private sector finance for delivery of transport infrastructure entails the use of availability payments.

Whilst some road PPPs in Australia have had significant challenges, driven by optimistic traffic forecasts, they have also contributed to the development of a more mature and sophisticated market for PPPs. Ultimately it has delivered road infrastructure that would have been otherwise deferred or not progressed at all.

1.2 KPMG's scope of work

KPMG has been engaged by Transurban to ***provide an independent assessment*** of the economic, social and environmental costs and benefits of the toll roads currently operating in Australia.

KPMG's scope of work included quantifying the 'total economic contribution' of the toll roads in Australia, including utilising the productivity metrics approach developed by the National Guidelines for Transport System Management (NGTSM). The approach entails initially assessing the direct business and personal travel time and vehicle operating cost savings, and productivity benefits/wider economic benefits of the toll roads currently operating, and then estimating total (including flow-on) economic contribution using a Computable General Equilibrium (CGE) model.

1.3 Report structure

Following this introductory section, the remainder of this report is structured as follows:

- Section 2 provides a brief description of the congestion challenges facing Australian cities, profiles the toll roads currently operating in Australia cities (the subject of this report) and discusses the approach adopted to assess the total economic contribution of toll roads.
- Section 3 assesses the total economic contribution of the toll roads currently operating in Australia, and discusses the extent to which toll roads have contributed to enhancing our economic performance.

Further detail around the role of transport and economic performance, challenges facing Australian cities and the detailed approach to assessing the total economic contribution is provided in the Appendices.

[3] BITRE (2014) Australian Infrastructure Statistics Yearbook and KPMG analysis.

2. Assessing the total economic contribution of toll roads in Australia

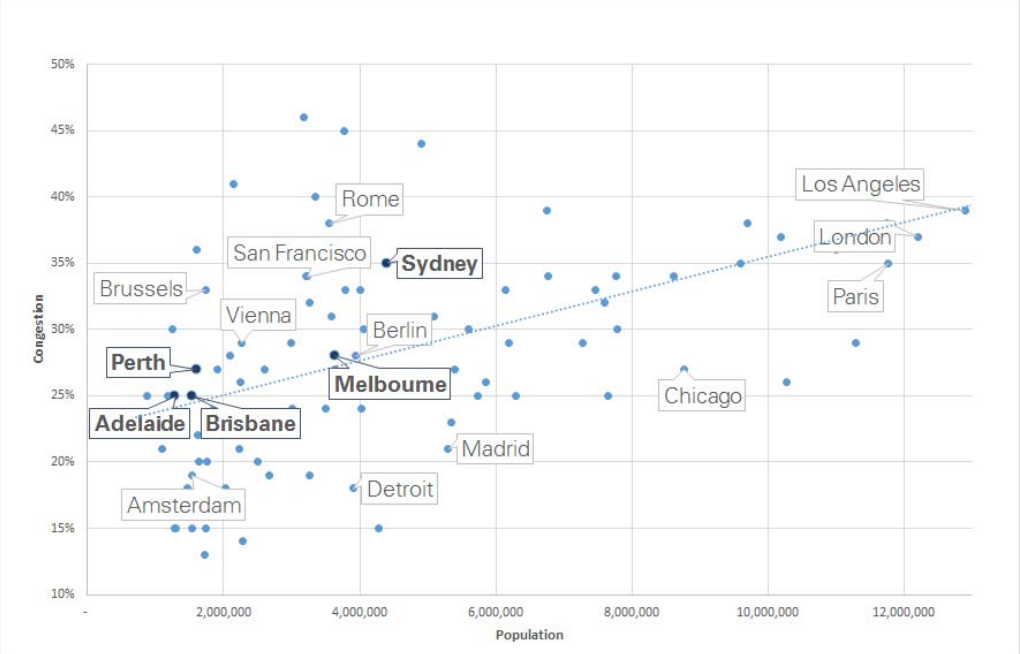
Transport, together with urban form, are critical elements that facilitate mobility. Transport infrastructure, whether it be road, rail, or bicycle paths, provides the community with access to a wide range of economic, social and cultural activities. Transport also provides businesses with access to other businesses and customers, and residents with access to employment. ***The transport system links people to jobs; delivers products to markets; underpins supply chains and logistics networks; and is the lifeblood of domestic and international trade.***[4]

The role of transport infrastructure in enhancing economic development outcomes is well understood by policy makers. Infrastructure projects or policies that address genuine accessibility needs can reduce travel time, improve travel time reliability and create a smoother flow of traffic across the entire network. Infrastructure also lowers transport costs, deepening markets and facilitating increased competition, leading to economies of agglomeration[5] and innovation. Reducing the distance travelled per trip also reduces fuel consumption per kilometre, in turn reducing greenhouse gas emissions.

2.1 Rapidly growing congestion

Despite Australian cities having relatively lower populations than many international counterparts, their residents spend a disproportionately large amount of their time in traffic. Figure 2 below demonstrates that congestion in all major Australian cities is higher than the average level of congestion relative to total population, as measured by the trend line.

Figure 2: Congestion levels and population



Source: KPMG analysis based on data from TomTom International and www.citymayors.com

[4] UK HM Treasury (Dec 2006) The Eddington Transport Study: The Case for Action p.11
[5] Agglomeration is the colocation of businesses in terms of physical adjacency and/or effective travel time.

Congestion is expected to worsen, impacting the economic performance of Australia's major cities. Infrastructure Australia states that the current cost of urban road congestion in the six largest capital cities is $13.7billion, and is projected to grow to $53.3 billion by 2031.[6]

Table 1: Cost of road congestion – 2011 and projected 2031

Urban area	2011	2031
Sydney/Newcastle/Woolongong	$5.55bn	$14.79bn
Melbourne/Geelong	$2.84bn	$9bn
Brisbane/Gold Coast/Sunshine Coast	$1.91bn	$9.21bn
Greater Perth	$1.78bn	$15.87bn
Greater Adelaide	$1.44bn	$3.75bn
Greater Canberra	$208m	$703m
Total	**$13.74bn**	**$53.32bn**

Source: Based on Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Table 2 Note: IA analysis only considers the six largest capital cities. Figures are reported in 2011 prices.

Further detail on transport challenges facing Australian cities are provided in Appendix A.

2.2 Toll roads in Australia

Government is increasingly developing toll roads to address road infrastructure bottlenecks and reduce congestion in Australian cities. A large number of Australia's current toll roads were delivered in the 1980s and 2000s by government or in partnership with the private sector. A major turning point was in 1992 when Transurban began to develop the CityLink toll road with the support of the Victorian Government, private equity and infrastructure bonds.[7]

At present, there are 16 toll roads in Australia; eight in NSW, six in Queensland and two in Victoria. A further four toll road projects are currently under development or under consideration, of which two are in NSW[8], one in Victoria[9] and one in Queensland[10].

Following pages briefly profiles the toll roads currently operating in Australia (and the subject of this economic assessment). Further detail on the toll roads are provided in Appendix B.

[6] Infrastructure Australia (2015), p.83 – Infrastructure Australia estimates the delay cost as the difference between trip time under congested conditions compared to uncongested conditions. (p.284) IA assumes future road network 'as is' with the addition of projects that are currently under way or funded.

[7] Transurban (2000) Transurban CityLink Limited – Annual Report 2000

[8] North Connex and WestConnex.

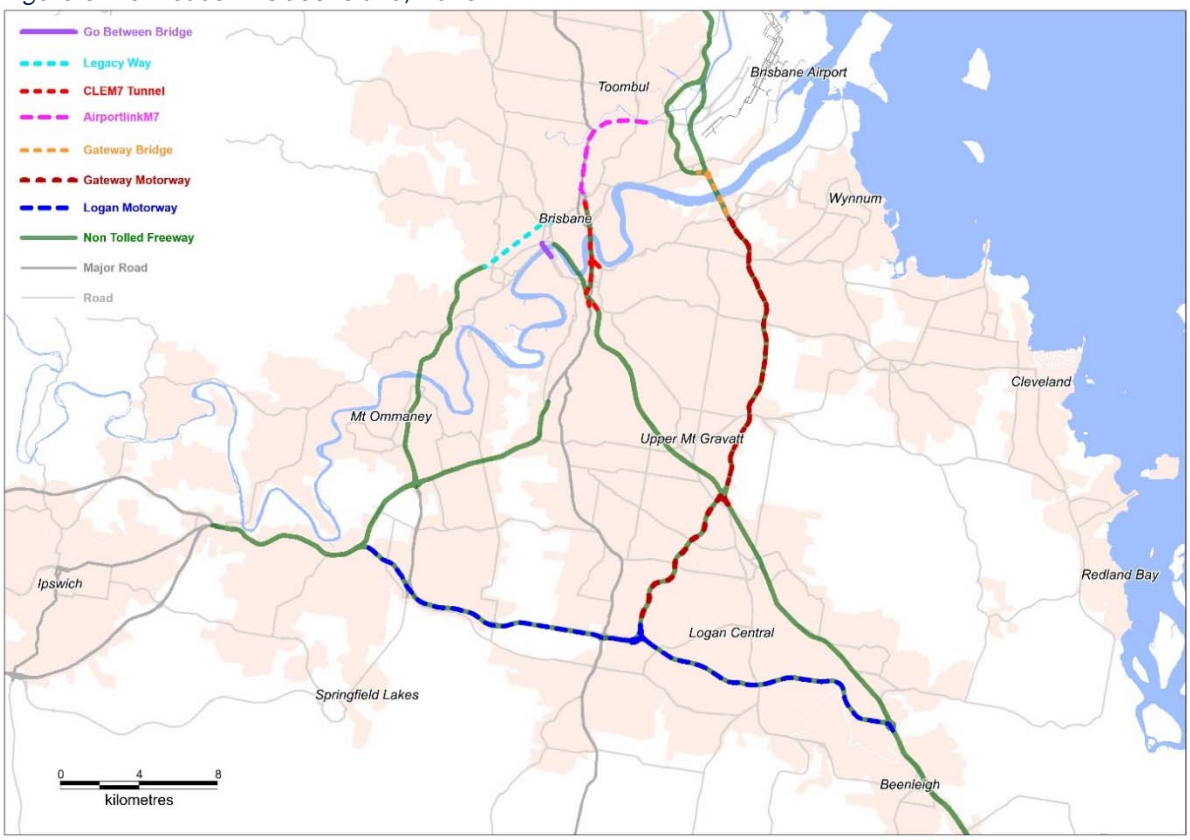
[9] Western Distributor.

[10] Toowoomba Bypass.

2.2.1 Toll roads in Queensland

Queensland has developed a number of toll roads since the 1980s, including the Sunshine and Logan Motorways, AirportlinkM7, CLEM7 and the Go Between Bridge. Although some recent toll road projects experienced revenue challenges due to optimistic traffic forecasts, these projects have delivered essential roads at little cost to government, and are increasingly attractive to private investors.

Figure 3: Toll roads in Queensland, 2015

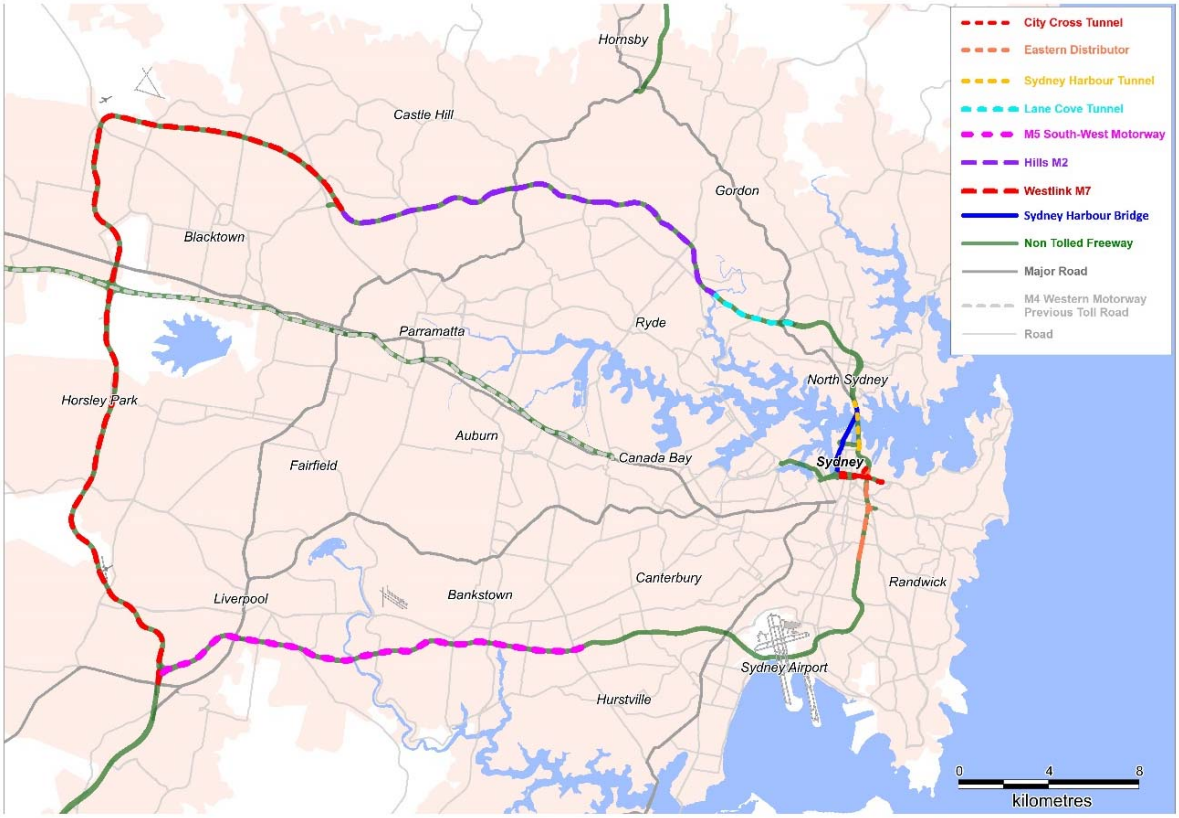


Source: KPMG

2.2.2 Toll roads in NSW

The Sydney Harbour Bridge in 1932 was the first major toll road in NSW. The bridge was funded in large part by NSW Government debt.[11] The government intended to repay the debt through tolls and a betterment levy on properties adjacent to the bridge.[12] The bridge continues to be tolled, and is owned and operated by the NSW Government. Between the 1960s, 70s and 2000s, toll roads were developed in NSW to connect the City of Sydney to Wollongong, Newcastle and the Blue Mountains. Many of these roads have since removed their toll and/or reverted to state Government ownership.

Figure 4: Toll roads in NSW, 2015



Source: KPMG

[11] Grattan (2012) Can we afford to get our cities back on the rails? p.13

[12] Ibid, p.13

2.2.3 Toll roads in Victoria

The first major toll road in Melbourne was the West Gate Bridge, completed in 1978. In 1985, the State Government removed tolls from the West Gate. CityLink, which was completed in 1999, was the next major road that was tolled in the State and was the first road infrastructure developed under a PPP arrangement in Victoria. In 2008 EastLink was opened to improve accessibility to the eastern suburbs.

Figure 5: Toll roads in Victoria, 2015

Source: KPMG

2.3 Approach to assessing the economic contribution of existing toll roads in Australia

This report assesses the total economic contribution of toll roads currently operating in Australia and profiled above. A high-level description of the approach adopted to assess the total economic contribution is provided below. Appendix C provides further details on the economic evaluation approach.

2.3.1 Economic assessment framework

Historically, transport projects have been assessed and prioritised using a conventional Cost Benefit Analysis (CBA) framework. The objective of the CBA is to identify project or policy options that enhance societal welfare. For transport projects, conventional CBA typically examines travel time savings, vehicle operating cost savings, reliability benefits, environmental externalities and accidents.

Figure 6: Economic assessment frameworks

Over the last few years, transport project evaluation is increasingly incorporating the concept of Wider Economic Benefits (WEBs) not captured within conventional CBA.[13] Both CBA and WEBs capture the direct impacts of the project or policy. By contrast, broader flow-on impacts of transport projects can be assessed using economy wide General Equilibrium macro-economic modelling (CGE model). Until recently, transport projects have been assessed using CBA, WEBs and CGE frameworks *separately.* However, it is valuable to combine the three frameworks to model the project impacts in terms of GDP/GSP. This combined approach enables us to more fully assess the economic contribution of transport projects[14].

2.3.2 Assessing total economic contribution

The most thorough transport project evaluation framework to date is the National Guidelines for Transport System Management (NGTSM). The NGTSM is currently being revised and will bring the guidelines up to date to ensure ongoing best practice. As part of the revision, the NGTSM published the paper on productivity metrics.[15] Productivity metrics are quantitative measures that assess the extent to which an initiative contributes to productivity at the state, territory and/or national level.

The NGTSM identifies a number of beneficial items that can be incorporated within the productivity metrics. KPMG adopted the NGTSM productivity metrics approach to assess the total economic contribution of toll roads in Australia. The analysis assesses the benefits of toll roads relative to a counter-factual scenario in which many of our critical motorways/roads:

- would have been delayed by 30 years – ***high scenario***;
- would have been delayed by 10 years – ***central scenario***; and
- would have been delayed by 5 years – ***low scenario***.

[13] The NGTSM defines productivity benefits as road user benefits to businesses (i.e. car users making business-related trips and freight users) resulting from a project or initiative which have a clear and significant productivity impact by reducing the costs of production or improving the productivity of inputs. Applicable road user benefits include travel time savings, vehicle operating cost savings, and reliability improvements for business and freight users as well as WEBs.
[14] Refer to Peter Forsyth (2014), Using CBA and CGE in Investment and Policy Evaluation for a detailed discussion on the benefits of combining CBA and CGE models for project and policy evaluations.
[15] Transport and Infrastructure Council (Dec 2014) National Guidelines for Transport System Management in Australia – Productivity Metrics

3. Economic contribution of toll roads in Australia

This section discusses the findings of the analysis undertaken to assess the total economic contribution of Australia's toll roads. This includes toll roads currently operating in Brisbane, Sydney[16] and Melbourne.

The analysis for each of the three states are presented in terms of:

- Annual economic and welfare benefits associated with toll roads;
- Changes in accessibility/who are the beneficiaries of toll roads; and
- Total foregone economic benefits had the existing road infrastructure been delayed by 10 years.

The analysis includes total economic contribution in terms of the toll roads' impact on GSP/GDP and employment.

Annual benefits of toll roads

The analysis quantified the key economic and welfare benefits associated with the operation of the toll roads. This component of analysis employed traffic modelling data for the year 2011 provided by Transurban for each State. This allowed KPMG to quantify the specific benefits of toll roads in terms of:

- ***Road user benefits*** – including travel time savings, vehicle operating cost savings and more reliable travel time;
- ***Non-user benefits*** – reduced greenhouse gas emissions; and,
- ***Wider economic benefits*** – the development of more efficient economic clusters, improved access to the labour market, and change in economic output under imperfectly competitive markets.

KPMG calculated economic and welfare benefits by assessing the difference in travel times and distances between each travel zone for toll road traffic using the toll road network and the non-tolled road network in each of the three cities.

The analysis considers the accrual of benefits to users of the toll roads only (i.e. how much time and vehicle operating costs they save). We have not incorporated any incremental costs associated with the additional congestion that would be caused by existing toll road users changing to use non-tolled networks. The increase in congestion from this patronage change would potentially result in excessive congestion in each city, causing travel patterns and land use to be markedly different. It was not feasible to model these possible outcomes due to the extent of potentially exponential outcomes. ***By not including these impacts, the analysis is considered highly conservative. The estimated annual benefit should therefore be interpreted as the minimum level of benefit attributable to the toll roads.***

Changes in accessibility/beneficiaries of toll roads

The majority of the economic benefits that can be attributed to toll roads are changes in accessibility throughout the road network. Accessibility refers to the ease of access to a destination or a set of economic and social 'opportunities'. In its simplest form, accessibility can be measured by changes in travel times from an origin to a destination. However, this measure of accessibility does not incorporate the value of travel to a destination (for example, improved access to the suburbs is assumed to be equally as beneficial as improved access to the CBD).

KPMG's study uses the concept of effective density to assess the changes in accessibility. Specifically, we adopt Business to Business Effective Density (B2BEd) as a measure to assess

[16] The analysis does not include the benefits associated with the Sydney Harbour Bridge, as the analysis focuses on toll roads developed over the last 30 years.

changes in accessibility given the focus on economic and productivity benefits. The B2BEd measure is consistent with the NGTSM approach for measuring agglomeration economies.

KPMG calculated the improvement in B2BEd for each specific travel zone (geographic boundary), within Sydney, Brisbane and Melbourne by considering:

- The generalised cost of the business trip from an origin to the destination;
- The number of jobs in that destination; and
- A distance decay function, that is, the willingness to travel to that destination given the generalised cost associated with that trip.

For each State, outputs from the transport models for the base year[17] have been analysed to estimate the change in B2BEd accessibility due to toll roads. Specifically, B2BEd is estimated for each origin to all other destinations under the base case (no toll roads) and project case (with toll roads) in 2011.

The change in B2BEd effective density is a reliable estimate of what areas have benefitted the most from toll roads. Where an area or region experiences a large change in B2BEd due to a transport improvement, accessibility to that area has been significantly improved.

Economic benefit of accelerated delivery of toll roads

The majority of Australia's toll roads comprise higher order motorways. They form major strategic radial and orbital links in the road networks of its major cities. These roads are so important that were they not built as toll roads, government would have eventually financed their construction. It is likely that these roads would have been built years later under a 'no toll' scenario compared to a 'tolled' scenario[18].

KPMG has modelled the benefits of toll roads on the assumption that the ***roads being assessed would have been delayed by 10 years (central scenario)***. The central scenario estimates the annual economic benefit of each toll road in operation in Australia as at 1 January 2011. The central scenario also assumes that operating these roads as direct user-pays toll roads enabled their construction and operation 10 years earlier than if they had been reliant on government funding only. The estimated value of toll roads in this scenario reflects the present value of their 10-year net benefit stream. This value represents the potential loss in economic benefit to Australia were they not constructed and operational between 2011 and 2021.

To ensure this analysis is reasonable, the KPMG modelling is supported by sensitivity analysis that estimates a high and a low 'no tolls' scenario as follows:

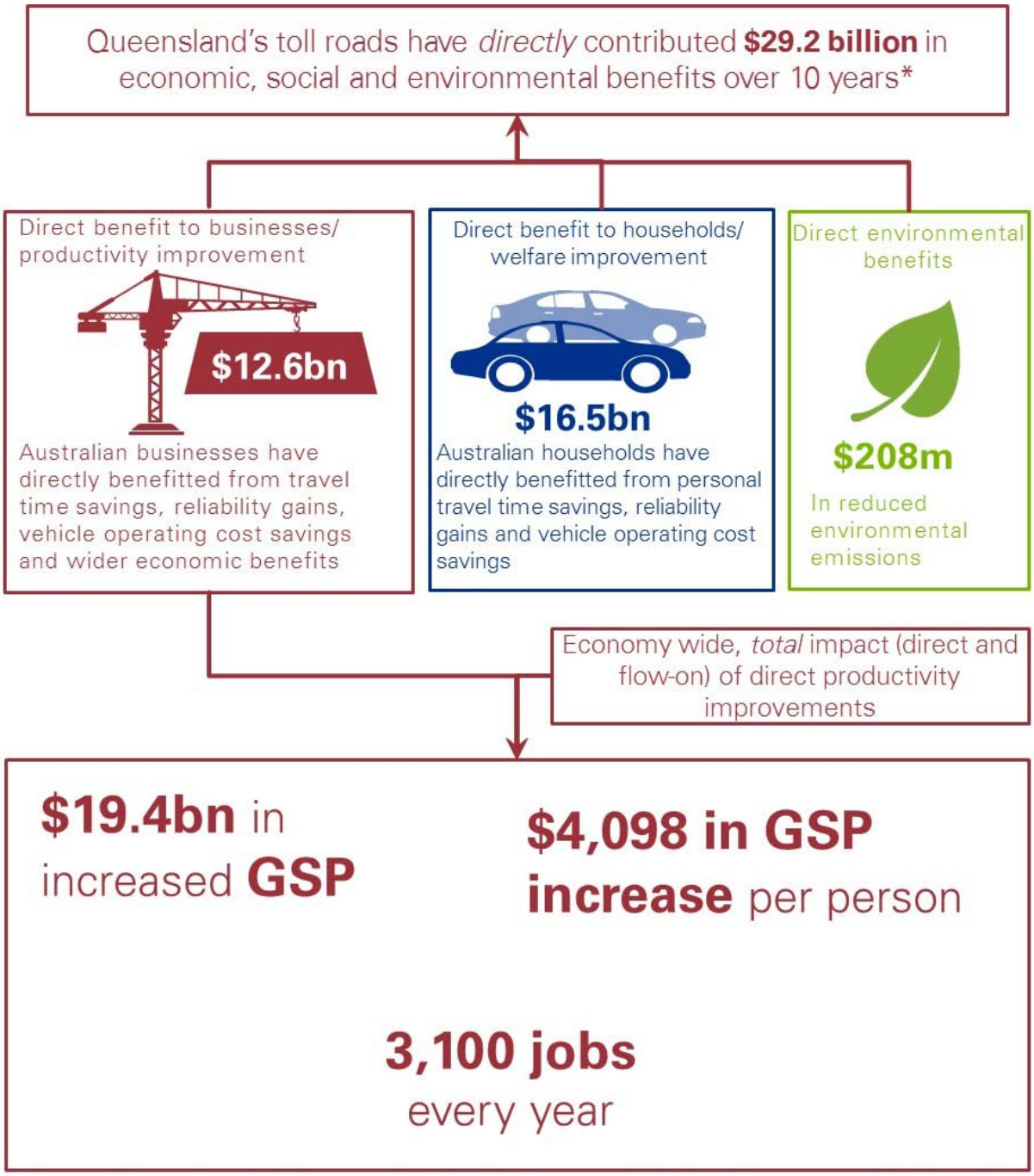
- ***High scenario:*** delivery of roads is delayed by 30 years.
- ***Low scenario:*** delivery of roads is delayed by five years.

The estimated CBA, WEBs and CGE benefits of toll roads under the central scenario are described in the following sections. The estimated benefits are presented in terms of their impact in Queensland, NSW and in Victoria.

[17] The base year is 2011 (the year for which traffic modelling data was available from Transurban).

[18] Economic analysis undertaken in this report does not take into account the procurement approach or the levying of tolls on the existing toll roads under the base case/ counter-factual. Rather, we simply postulate that if not for the procurement and delivery approach adopted by the existing toll roads, these roads would have still been delivered but would have been delayed by 10 years under the central scenario.

3.1 Economic contribution of toll roads in Queensland



* All $ values are reported in present value terms using Infrastructure Australia recommended real discount rate of 7 per cent, which equates to a nominal discount rate of 9.7 per cent.

3.1.1 Overview

Queensland's toll roads can be broadly grouped under two categories:

- an orbital network consisting of the Gateway Motorway (including the tolled Gateway Bridge), and the Logan Motorway which opened in the mid- to late-1980s; and
- Inner city/inner-urban bypass consisting of the CLEM7, AirportlinkM7 and Go Between Bridge which opened in stages from 2010. A fourth inner-urban bypass – Legacy Way – opened in June 2015.

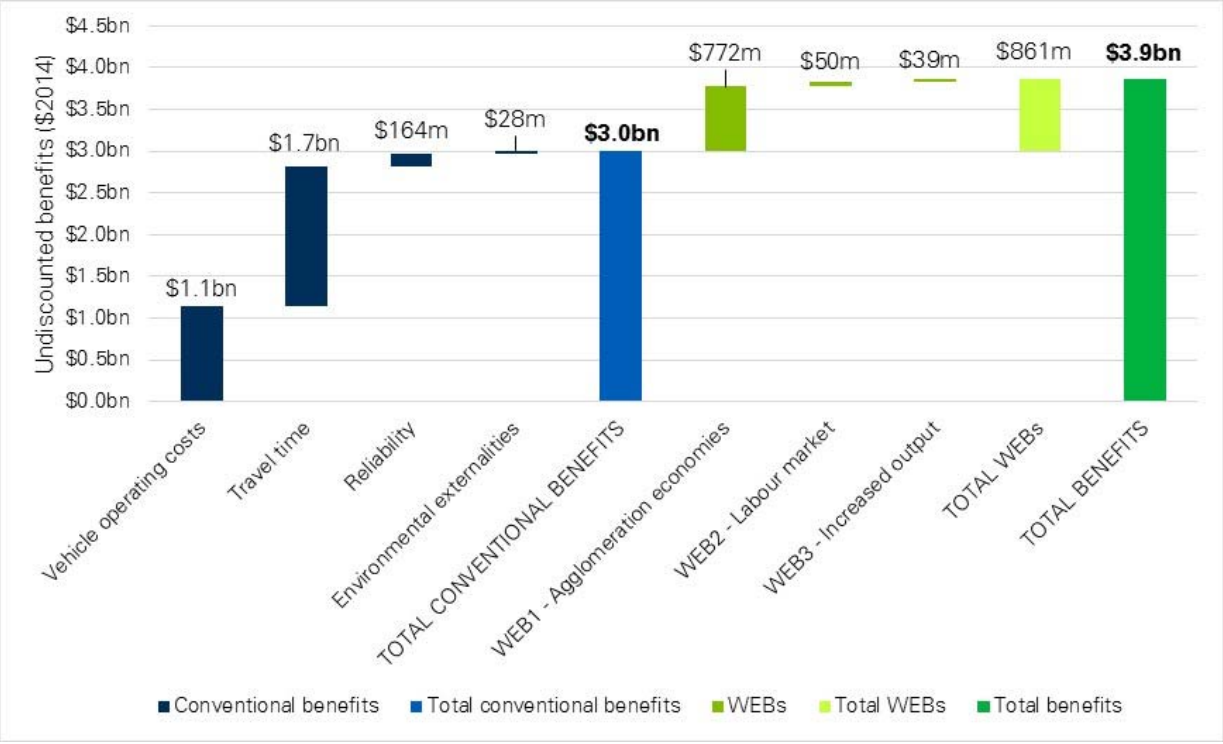
The understanding of the function of these toll roads in the broader transport network is important to understanding the changes in accessibility and therefore overall economic contribution.

3.1.2 Annual benefits of toll roads

Using the transport model outputs from Transurban, the annual economic and welfare benefits attributable to the toll roads in Queensland for the year 2011 was estimated. Based on the difference in travel costs[19] of using tolled versus un-tolled routes between 3,000 travel zones across South East Queensland. The results of the analysis is shown in Figure 7.

Overall, the annual benefit of the toll roads in Queensland is estimated to be $3.9 billion. This comprises almost $3 billion of road user benefits (reduced travel times, reduced vehicle operating costs and improved travel time reliability), and $861 million of wider economic benefits. The remaining $28 million is attributable to greenhouse gas emission savings.

Figure 7: Annual benefits of toll roads in Queensland

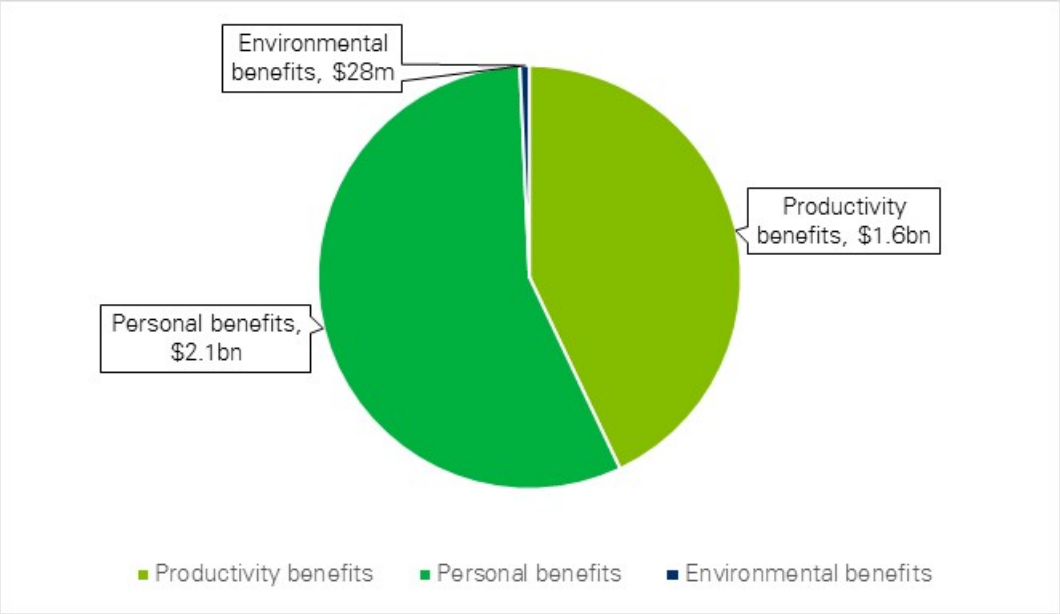


Source: KPMG analysis.

[19] Comprising time and monetary costs.

Figure 8 shows that 43 per cent of the annual benefits of Queensland's toll roads are considered to be productivity benefits, providing a direct boost to the State GSP.

Figure 8: Annual productivity benefits of toll roads in Queensland



Source: KPMG analysis.

3.1.3 Beneficiaries of toll roads

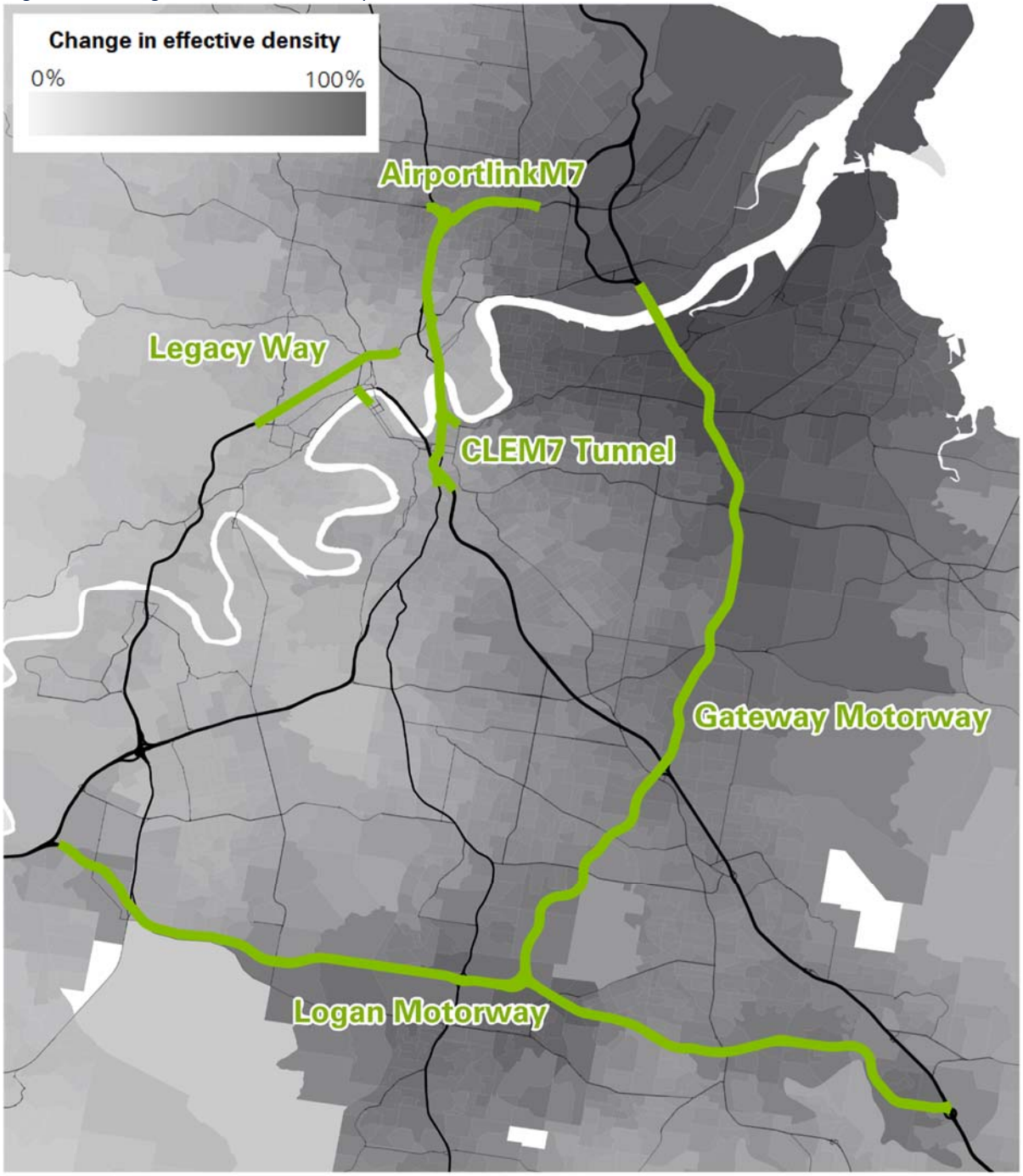
Figure 9 shows the change in accessibility, as measured via B2BEd, attributable to Queensland's toll roads.

The darker areas in the figure experienced large improvements in accessibility resulting from Queensland's toll roads. This change in accessibility is principally within the Gateway and Logan motorways' orbital corridors.

The largest change in accessibility is in the area south and east of the Gateway Bridge. This area has an increase of approximately 90 per cent in accessibility due to the tolled crossing. The Gateway Bridge also connects two large employment bases either side of the Brisbane River – the airport to the north, and the Port of Brisbane to the south. Further south, there are also increases in effective density around the Logan area. The Gateway and Logan motorways connect major employment hubs at the Brisbane Multimodal Terminal and the South West Industrial Precinct.

Accessibility due to the newer radial routes of the CLEM7, AirportlinkM7 and Go Between Bridge is lower than the orbital routes; however the area around the Bowen Hills portals of the AirportlinkM7 and CLEM7 tunnels experience accessibility increases of around 30 per cent.

Figure 9: Change in effective density due to toll roads (Queensland)



Source: KPMG Analysis

3.1.4 Economic contribution of accelerated delivery of toll roads

Using Infrastructure Australia's recommended real discount rate of 7 per cent[20], the analysis shows that over a 10-year period, the present value of the foregone benefits equates to over $29 billion. Of the total $29 billion, about $13 billion is estimated to be direct productivity benefits that would not be realised if Queensland's toll roads were not operational.

Table 2: Benefits of 10-year accelerated delivery time – Queensland

		Present value over 10 years
	Conventional economic benefits	
1	**Benefits to business and freight users**	**$6.1bn**
1a	Vehicle operating cost savings	$3.2bn
1b	Travel time savings	$2.6bn
1c	Travel time reliability benefits	$0.3bn
2	**Benefits to personal users[21]**	**$16.5bn**
2a	Vehicle operating cost savings	$5.5bn
2b	Travel time savings	$10.0bn
2c	Travel time reliability benefits	$0.9bn
3	**Other benefits**	**$0.2bn**
3a	Environmental externalities	$0.2bn
4=1+2+3	**TOTAL CONVENTIONAL BENEFITS**	**$22.8bn**
	Wider economic benefits	
5	WEB1 – Agglomeration economies	$5.8bn
6	WEB2 – Labour market deepening	$0.4bn
7	WEB3 – Increased output under imperfectly competitive markets	$0.3bn
8=5+6+7	**TOTAL WIDER ECONOMIC BENEFITS**	**$6.5bn**
9=4+8	**TOTAL BENEFITS**	**$29.2bn**
10=1+8	Productivity benefits	$12.6bn
	Economic impact analysis	
11=CGEx10	Gross State Product	$19.4bn
12=CGEx10	Gross State Product per capita	$4,098
13=CGEx10	Annual employment	3,100
14=CGEx10	Change in capital stock	0.83%

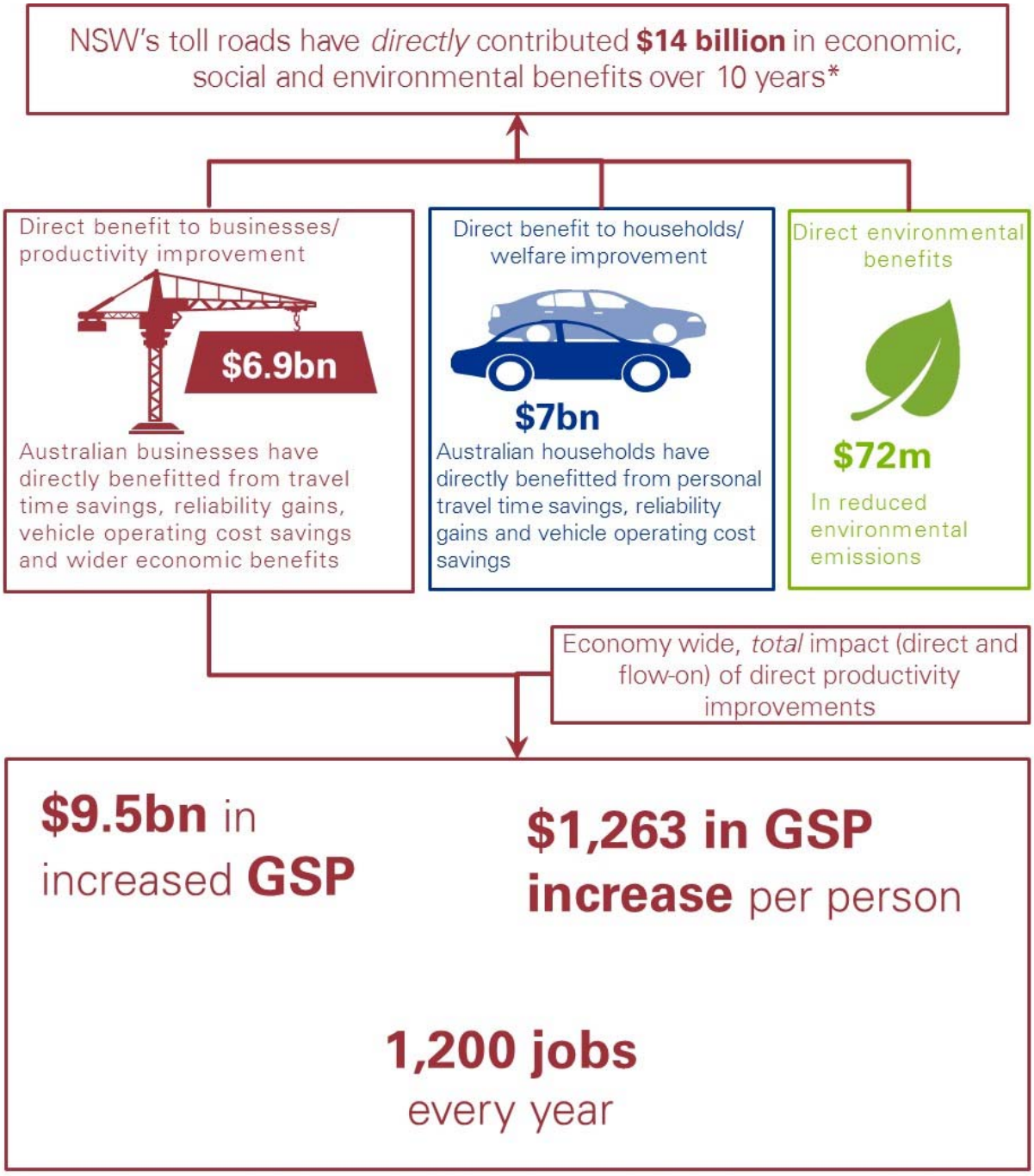
Source: KPMG analysis. Note: Monetary values presented in Q2 $2014. Monetary values discounted at 7%.

Taking into account the direct and in-direct impacts, the CGE modelling demonstrates that Queensland's GSP would be higher by $19 billion over the 10-year period, which translates to an increase of approximately $4,100 per person (in present value terms). Conversely, if Queensland's toll roads were not operational then Queenslanders would be worse off, on average, by approximately $4,100. CGE modelling also demonstrates that the productivity benefits from toll roads in Queensland directly and indirectly support about 3,100 jobs per annum.

[20] Assuming inflation of 2.5 per cent (the mid-point of Reserve Bank of Australia's consumer price index target of between 2 and 3 per cent), the 7 per cent real discount rate equates to a nominal discount rate of 9.7 per cent.

[21] Consistent with the NGTSM Productivity Metrics paper, personal travel time, vehicle operating costs and reliability benefits are not included in the productivity benefits. Refer to Appendix, Section C.3.2 for further detail on productivity metrics.

3.2 Economic contribution of toll roads in NSW



* All $ values are reported in present value terms using Infrastructure Australia recommended real discount rate of 7 per cent, which equates to a nominal discount rate of 9.7 per cent.

3.2.1 Overview

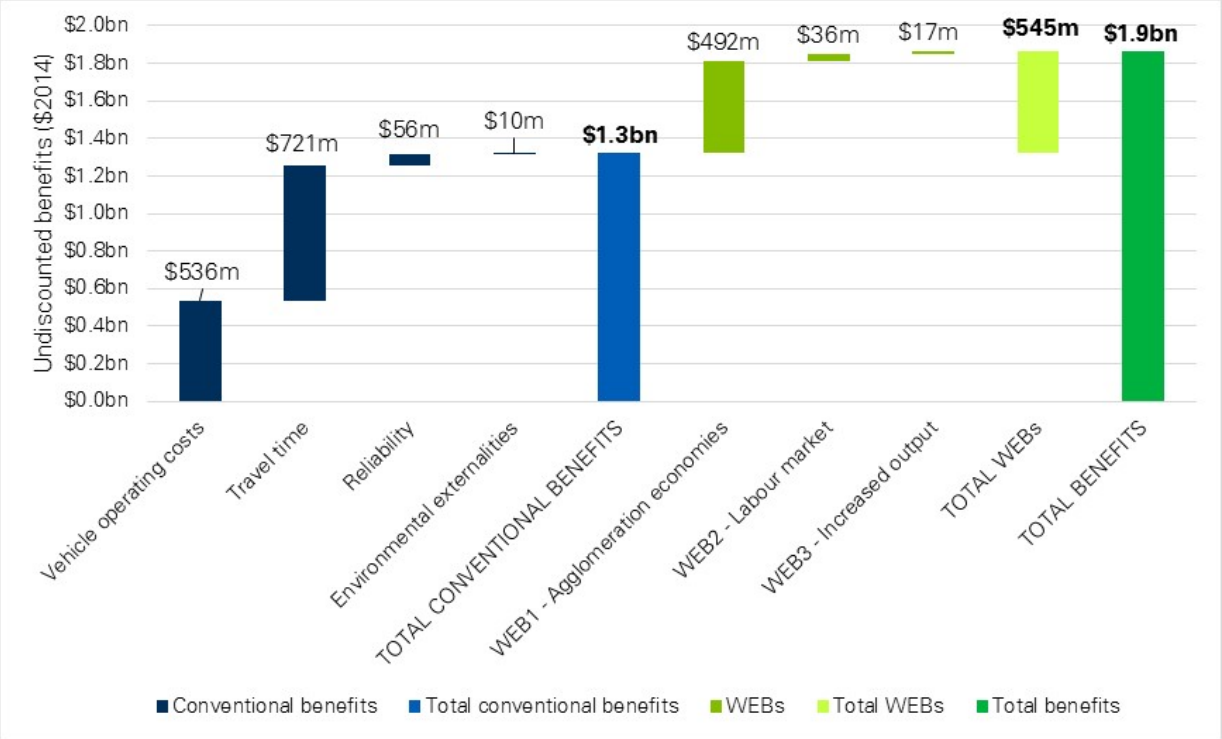
NSW toll roads comprise a series of orbital routes around Greater Sydney; two cross-CBD tunnels, and the Sydney Harbour Bridge and Tunnel.[22]

3.2.2 Annual benefits of toll roads

Using the transport model outputs from Transurban, the annual economic and welfare benefits attributable to the toll roads in NSW for the year 2011 was estimated.[23] The results of the analysis is summarised in Figure 10.

Overall, the annual economic benefit of toll roads in NSW has been estimated at $1.9 billion. Approximately $1.3 billion of the total benefits are derived by the toll road users due to reduced travel times, reduced vehicle operating costs and improved travel time reliability. NSW toll roads also generate approximately $545 million in WEBs. The remaining $10 million in benefits is attributable to reductions in greenhouse gas emission savings.

Figure 10: Annual benefits of toll roads in NSW

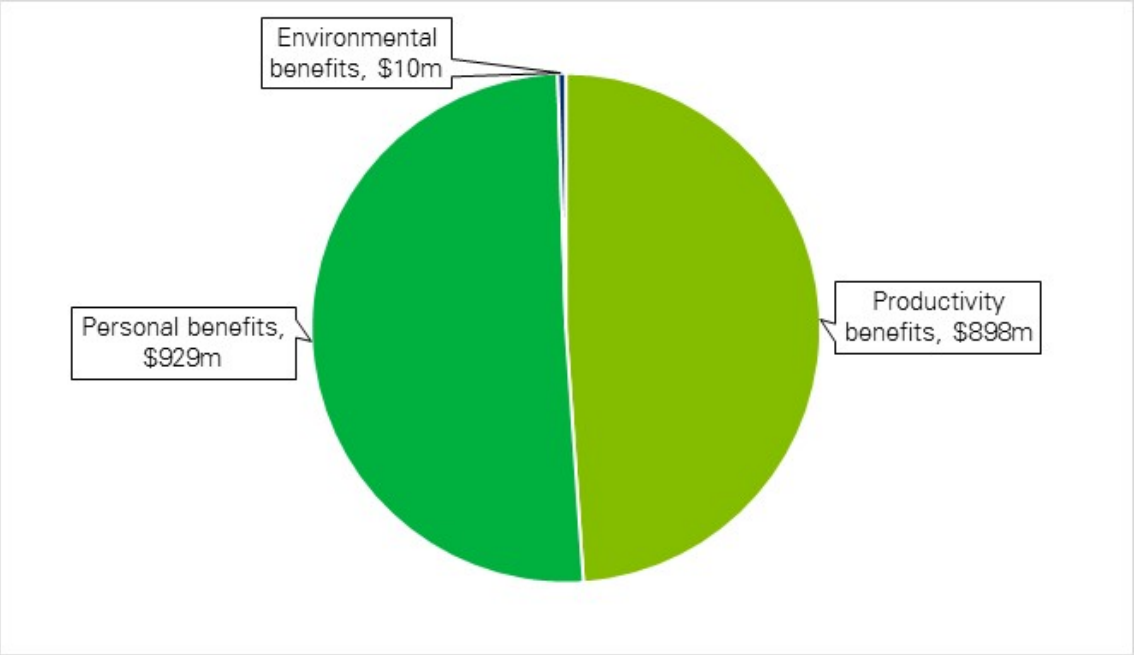


Source: KPMG analysis.

[22] Of the latter two categories, the Eastern Distributor and Sydney Harbour Tunnel also form part of the orbital route.
[23] The analysis does not include the benefits attributable to Sydney Harbour Bridge, which remains a tolled road in one direction. This is because the analysis focuses on the toll roads delivered over the last 30 years.

Figure 11 shows that almost half of the annual benefits from toll roads in NSW are productivity benefits.

Figure 11: Annual productivity benefits of toll roads in NSW

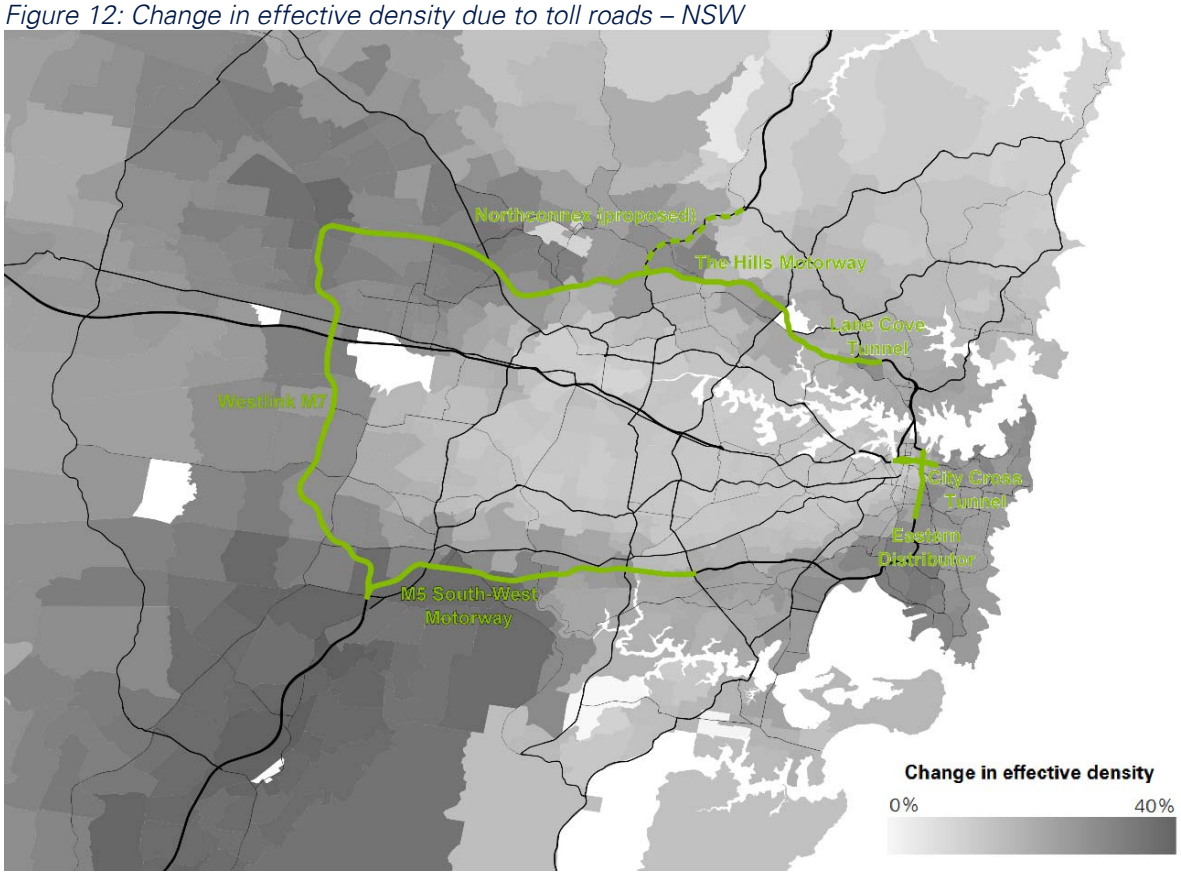


Source: KPMG analysis.

3.2.3 Beneficiaries of toll roads

Figure 12 below shows the change in accessibility attributable to the toll roads operating in NSW.

Figure 12: Change in effective density due to toll roads – NSW



Source: KPMG Analysis

This shows the areas that benefit most from the toll roads are in two main clusters within Greater Sydney, being:

- to the west of Greater Sydney in an arc following the Westlink M7 motorway; and
- to the east in the area around Port Botany and Sydney Airport.

The largest change in accessibility is realised in the south-west of Greater Sydney around Campbelltown, which recorded an increase of approximately 40 per cent in B2BEd due to the improved accessibility to economic centres via the M5 South West and Westlink M7 motorways (relative to the accessibility offered by non-tolled routes). Along the Westlink M7 corridor from Prestons to Baulkham Hills, the accessibility due to toll roads increases by an average of 25 per cent.

In the southeast quadrant in and around Sydney Airport accessibility increases by between 20 and 30 per cent due to the toll roads including the Eastern Distributor and Sydney Harbour Tunnel.

3.2.4 Economic contribution of accelerated delivery of toll roads

Using Infrastructure Australia's recommended real discount rate of 7 per cent[24], the analysis shows that over a 10-year period, the present value of the foregone benefits equates to $14 billion. Of this total, approximately half the benefits are direct productivity benefits which would not be realised if NSW' toll roads were not operational.

The CGE modelling demonstrates that NSW' GSP would be higher by $9.5 billion over the 10 year period, which translates to an increase of approximately $1,200 per person (in present value terms). The analysis also demonstrates that the productivity benefits from toll roads in NSW directly and indirectly support about 1,200 jobs per annum.

Table 3: Benefits of 10-year accelerated delivery time – NSW

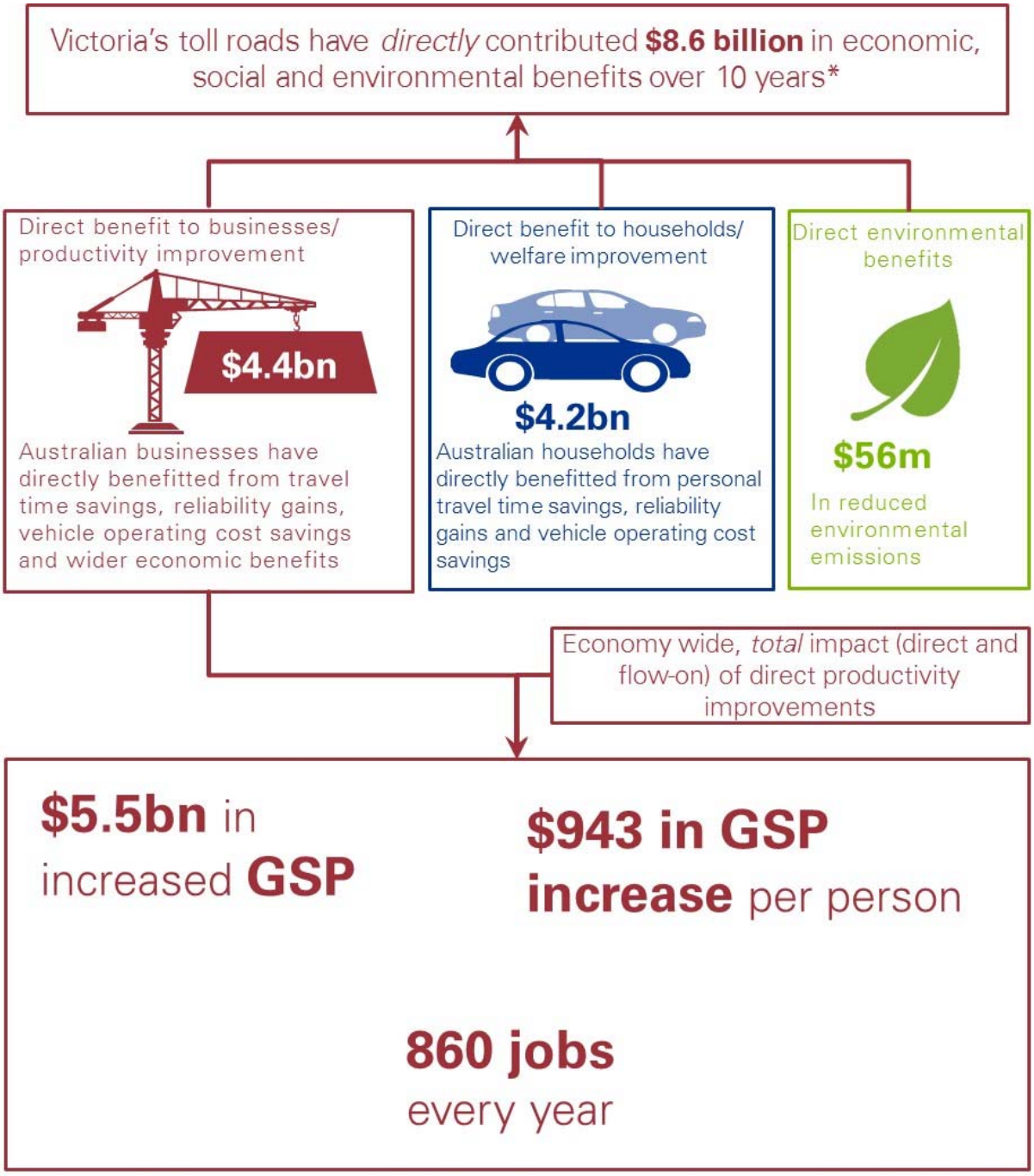
		Present value over 10 years
	Conventional economic benefits	
1	**Benefits to business and freight users**	**$2.8bn**
1a	Vehicle operating cost savings	$1.5bn
1b	Travel time savings	$1.2bn
1c	Travel time reliability benefits	$0.1bn
2	**Benefits to personal users[25]**	**$7.1bn**
2a	Vehicle operating cost savings	$2.5bn
2b	Travel time savings	$4.2bn
2c	Travel time reliability benefits	$0.3bn
3	**Other benefits**	**$0.1bn**
3a	Environmental externalities	$0.1bn
4=1+2+3	**TOTAL CONVENTIONAL BENEFITS**	**$9.9bn**
	Wider economic benefits	
5	WEB1 – Agglomeration economies	$3.7bn
6	WEB2 – Labour market deepening	$0.3bn
7	WEB3 – Increased output under imperfectly competitive markets	$0.1bn
8=5+6+7	**TOTAL WIDER ECONOMIC BENEFITS**	**$4.1bn**
9=4+8	**TOTAL BENEFITS**	**$14.0bn**
10=1+8	Productivity benefits	$6.9bn
	Economic impact analysis	
11=CGEx10	Gross State Product	$9.5bn
12=CGEx10	Gross State Product per capita	$1,263
13=CGEx10	Annual employment	1,200
14=CGEx10	Change in capital stock	0.21%

Source: KPMG analysis. Note: Monetary values presented in Q2 $2014. Monetary values discounted at 7%.

[24] Assuming inflation of 2.5 per cent (the mid-point of Reserve Bank of Australia's consumer price index target of between 2 and 3 per cent), the 7 per cent real discount rate equates to a nominal discount rate of 9.7 per cent.

[25] Consistent with the NGTSM Productivity Metrics paper, personal travel time, vehicle operating costs and reliability benefits are not included in the productivity benefits. Refer to Appendix, Section C.3.2 for further detail on productivity metrics.

3.3 Economic contribution of toll roads in Victoria



* All $ values are reported in present value terms using Infrastructure Australia recommended real discount rate of 7 per cent, which equates to a nominal discount rate of 9.7 per cent.

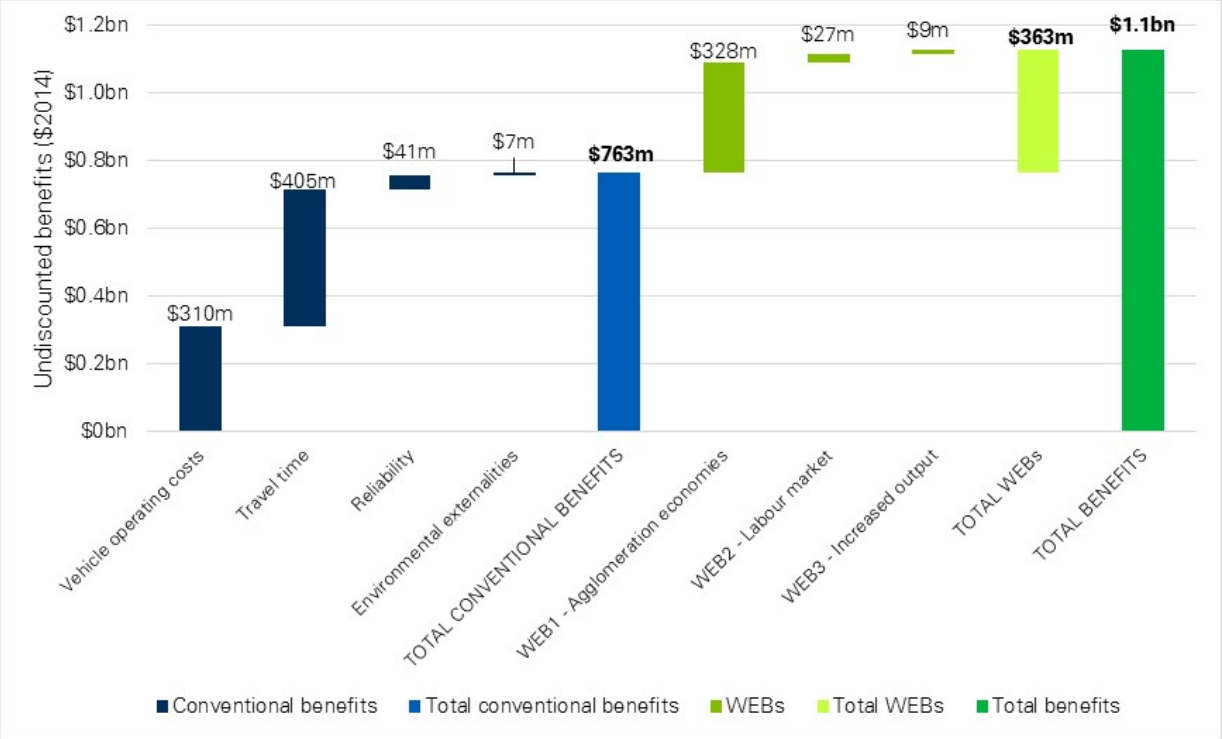
3.3.1 Overview

Victoria's toll road network comprises of CityLink's Western and Southern Links – two radial routes serving the north-west and south-east of the city – and EastLink, an orbital route serving the eastern and south-eastern suburbs.

3.3.2 Annual benefits of toll roads

The annual economic benefit resulting from toll roads in Victoria for the year 2011, based upon the difference in travel costs[26] of using tolled and un-tolled routes in Greater Melbourne is summarised in Figure 13 below. Overall, the annual economic benefit of toll roads in Victoria is estimated to be around $1.1 billion, of which approximately $760 million of benefits are derived directly by the road user through reduced travel times, reduced vehicle operating costs and improved travel time reliability, and $363 million is attributable to WEBs. The remaining $7 million in benefits is due to greenhouse gas emission savings.

Figure 13: Annual economic benefits of toll roads in Victoria

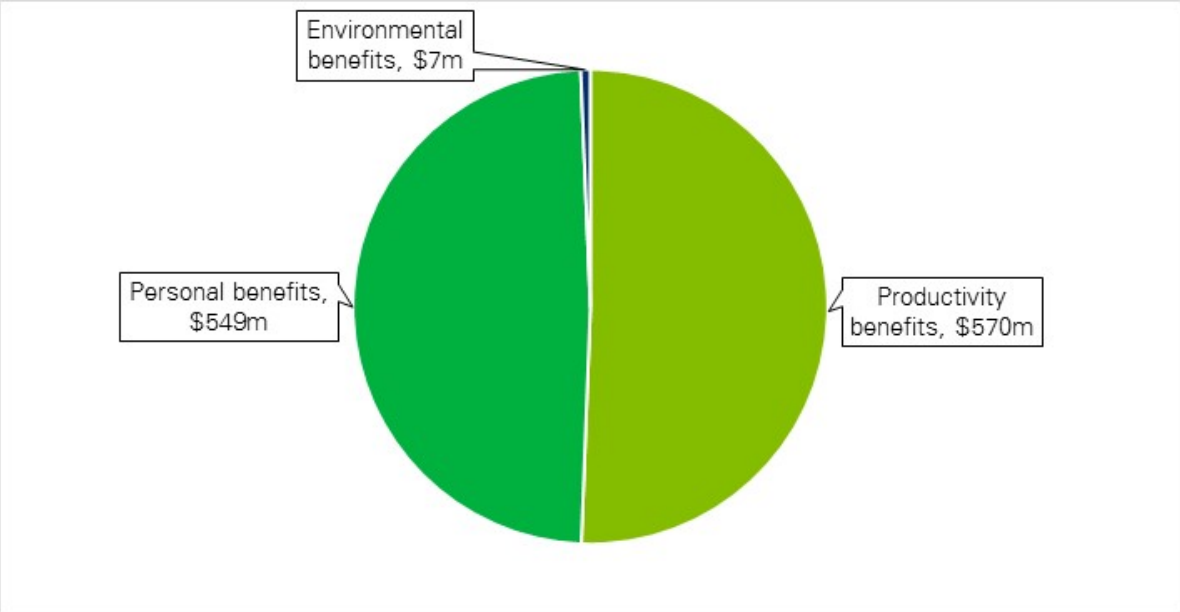


Source: KPMG analysis.

[26] Comprising time and monetary costs.

Similar to NSW, approximately half of the direct benefits of toll roads in Victoria are estimated to be productivity benefits.

Figure 14: Annual productivity benefits of toll roads in Victoria



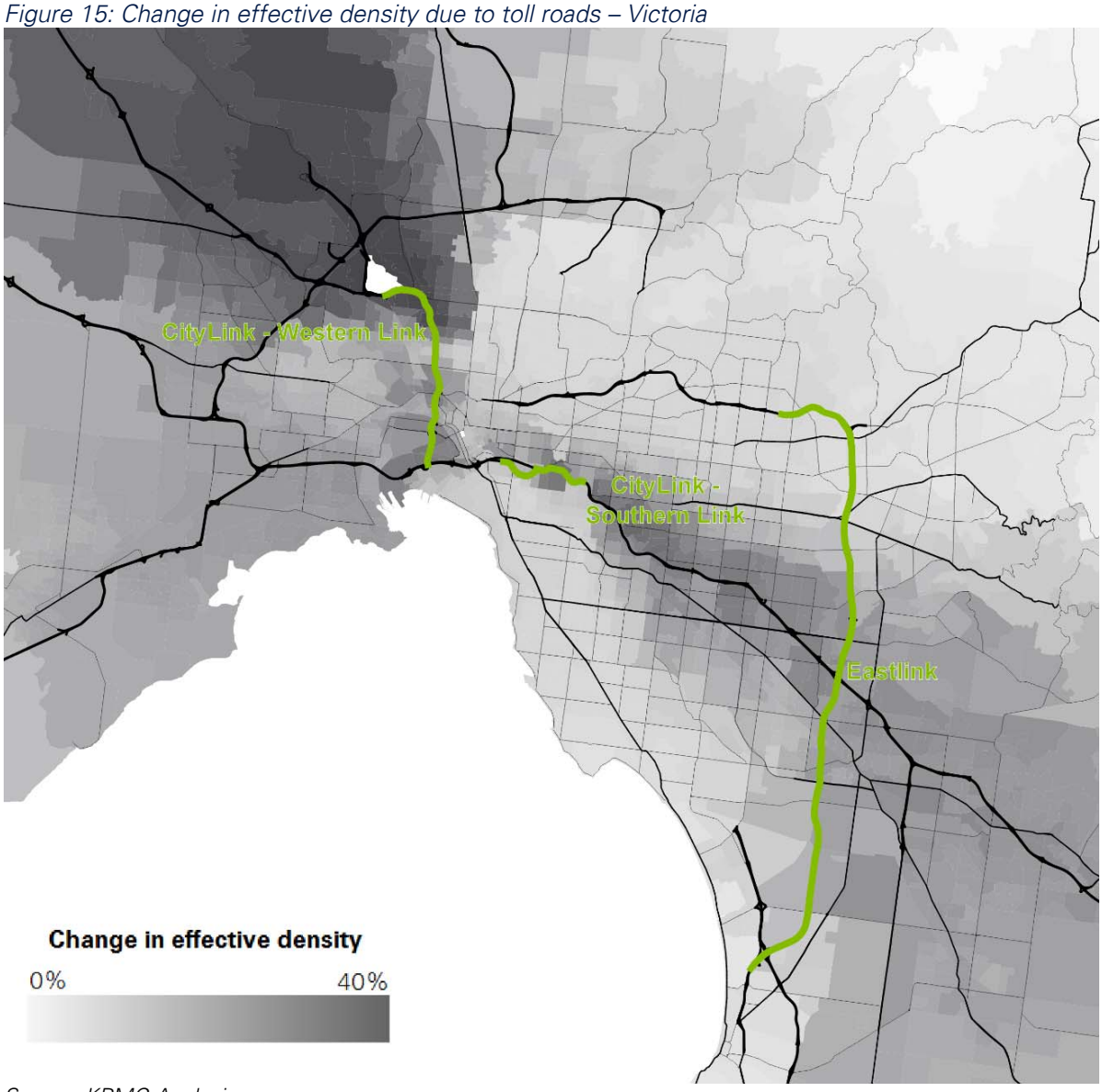
Source: KPMG analysis.

3.3.3 Beneficiaries of toll roads

The change in accessibility due to the use of toll roads in Melbourne is shown in Figure 15. The key beneficiaries of the Victorian toll roads are located in the north-west of the city in the area around the Melbourne Airport. This area has an increase in accessibility of approximately 40 per cent, principally attributable to the CityLink – Western link.

The communities along the M1 (Monash Freeway) corridor and the southern half of EastLink also experience an improvement in accessibility of approximately 20 per cent.

Figure 15: Change in effective density due to toll roads – Victoria



Source: KPMG Analysis

3.3.4 Economic contribution of accelerated delivery of toll roads

Over a 10-year period, it is estimated that the present value of the foregone benefits associated with the Victorian toll road system equates to $8.6 billion.

The CGE modelling demonstrates that Victoria's GSP is higher by $5.5 billion because of this toll road system, which translates to an increase of approximately $943 per person (in present value terms). The analysis also demonstrates that the productivity benefits from toll roads in Victoria have directly and indirectly supported approximately 860 jobs per annum.

Table 4: Benefits of 10-year accelerated delivery time – Victoria

		Present value over 10 years
	Conventional economic benefits	
1	**Benefits to business and freight users**	**$1.6bn**
1a	Vehicle operating cost savings	$0.9bn
1b	Travel time savings	$0.6bn
1c	Travel time reliability benefits	$0.1bn
2	**Benefits to personal users[27]**	**$4.2bn**
2a	Vehicle operating cost savings	$1.4bn
2b	Travel time savings	$2.5bn
2c	Travel time reliability benefits	$0.2bn
3	**Other benefits**	**$0.1bn**
3a	Environmental externalities	$0.1bn
4=1+2+3	**TOTAL CONVENTIONAL BENEFITS**	**$5.9bn**
	Wider economic benefits	
5	WEB1 – Agglomeration economies	$2.5bn
6	WEB2 – Labour market deepening	$0.2bn
7	WEB3 – Increased output under imperfectly competitive markets	$0.1bn
8=5+6+7	**TOTAL WIDER ECONOMIC BENEFITS**	**$2.8bn**
9=4+8	**TOTAL BENEFITS**	**$8.6bn**
10=1+8	Productivity benefits	$4.4bn
	Economic impact analysis	
11=CGEx10	Gross State Product	$5.5bn
12=CGEx10	Gross State Product per capita	$943
13=CGEx10	Annual employment	860
14=CGEx10	Change in capital stock	0.16%

Source: KPMG analysis. Note: Monetary values presented in Q2 $2014. Monetary values discounted at 7%.

[27] Consistent with the NGTSM Productivity Metrics paper, personal travel time, vehicle operating costs and reliability benefits are not included in the productivity benefits. Refer to Appendix, Section C.3.2 for further detail on productivity metrics.

3.4 Sensitivity analysis

The central scenario discussed in previous pages is based on the assumption that had the roads being analysed not been delivered as toll roads then these road projects would still be delivered as traditional, government procured no toll projects but would have been delayed by 10 years.

Sensitivity analysis has been undertaken for a high and low scenario as follows:

- ***High scenario:*** delivery of roads is delayed by 30 years.
- ***Low scenario:*** delivery of roads is delayed by 5 years.

The results of the sensitivity analysis are summarised in Table 5 below and Table 6 overleaf.

The analysis demonstrates that even under the low scenario, the foregone benefits are significant at $29bn across the three States, with foregone productivity benefits estimated at approximately $13bn.

Due to the effect of discounting, whereby benefits in earlier years are weighted more highly than those in later years, the foregone benefits under the low scenario (five years' benefits lost) are over one-half those in central scenario (10 years' benefits lost) and around one-third of those in high scenario (30 years' benefits lost).

Table 5: Low scenario – toll roads delayed by 5 years

		State			Total
	Benefit type	**VIC**	**QLD**	**NSW**	
1	Business VOC Savings	$522m	$1,786m	$838m	$3,146m
2	Business Time Savings	$329m	$1,427m	$667m	$2,422m
3	Business Reliability Savings	$40m	$187m	$58m	$285m
4	Personal VOC Savings	$808m	$3,089m	$1,435m	$5,331m
5	Personal Time Savings	$1,410m	$5,576m	$2,392m	$9,378m
6	Personal Reliability Benefits	$138m	$508m	$180m	$826m
7	Environmental Externalities	$31m	$116m	$40m	$188m
8=1+2+3+4+5+6+7	**Total Conventional Benefits**	**$3,278m**	**$12,689m**	**$5,610m**	**$21,576m**
9	WB1	$1,407m	$3,232m	$2,085m	$6,724m
10	WB2	$114m	$210m	$153m	$478m
11	WB3	$37m	$161m	$72m	$271m
12=9+10+11	**Total WEBs**	**$1,557m**	**$3,604m**	**$2,311m**	**$7,472m**
13=8+12	**TOTAL BENEFITS**	**$4,835m**	**$16,292m**	**$7,921m**	**$29,048m**
14=1+2+3+12	Productivity Benefits	$2,448m	$7,003m	$3,874m	$13,325m

Source: KPMG analysis. Note: Monetary values presented in Q2 $2014. Benefits are expressed in present value terms using 7% real discount rate.

Table 6: High scenario – toll roads delayed by 30 years

	Benefit type	State			Total
		VIC	QLD	NSW	
1	Business VOC Savings	$1,792m	$6,204m	$2,812m	$10,808m
2	Business Time Savings	$1,128m	$4,958m	$2,236m	$8,321m
3	Business Reliability Savings	$137m	$649m	$195m	$980m
4	Personal VOC Savings	$2,773m	$10,730m	$4,812m	$18,315m
5	Personal Time Savings	$4,841m	$19,373m	$8,023m	$32,237m
6	Personal Reliability Benefits	$475m	$1,764m	$604m	$2,842m
7	Environmental Externalities	$108m	$400m	$138m	$645m
8=1+2+3+4+5+6+7	**Total Conventional Benefits**	**$11,254m**	**$44,078m**	**$18,818m**	**$74,150m**
9	WB1	$4,829m	$11,228m	$6,994m	$23,051m
10	WB2	$391m	$731m	$515m	$1,636m
11	WB3	$126m	$561m	$243m	$930m
12=9+10+11	**Total WEBs**	$5,346m	$12,519m	$7,751m	$25,617m
13=8+12	**TOTAL BENEFITS**	**$16,600m**	**$56,597m**	**$26,570m**	**$99,766m**
14=1+2+3+12	Productivity Benefits	$8,403m	$24,330m	$12,993m	$45,726m

Source: KPMG analysis. Note: Monetary values presented in Q2 $2014. Benefits are expressed in present value terms using 7% real discount rate.

3.5 Conservativeness of the analysis

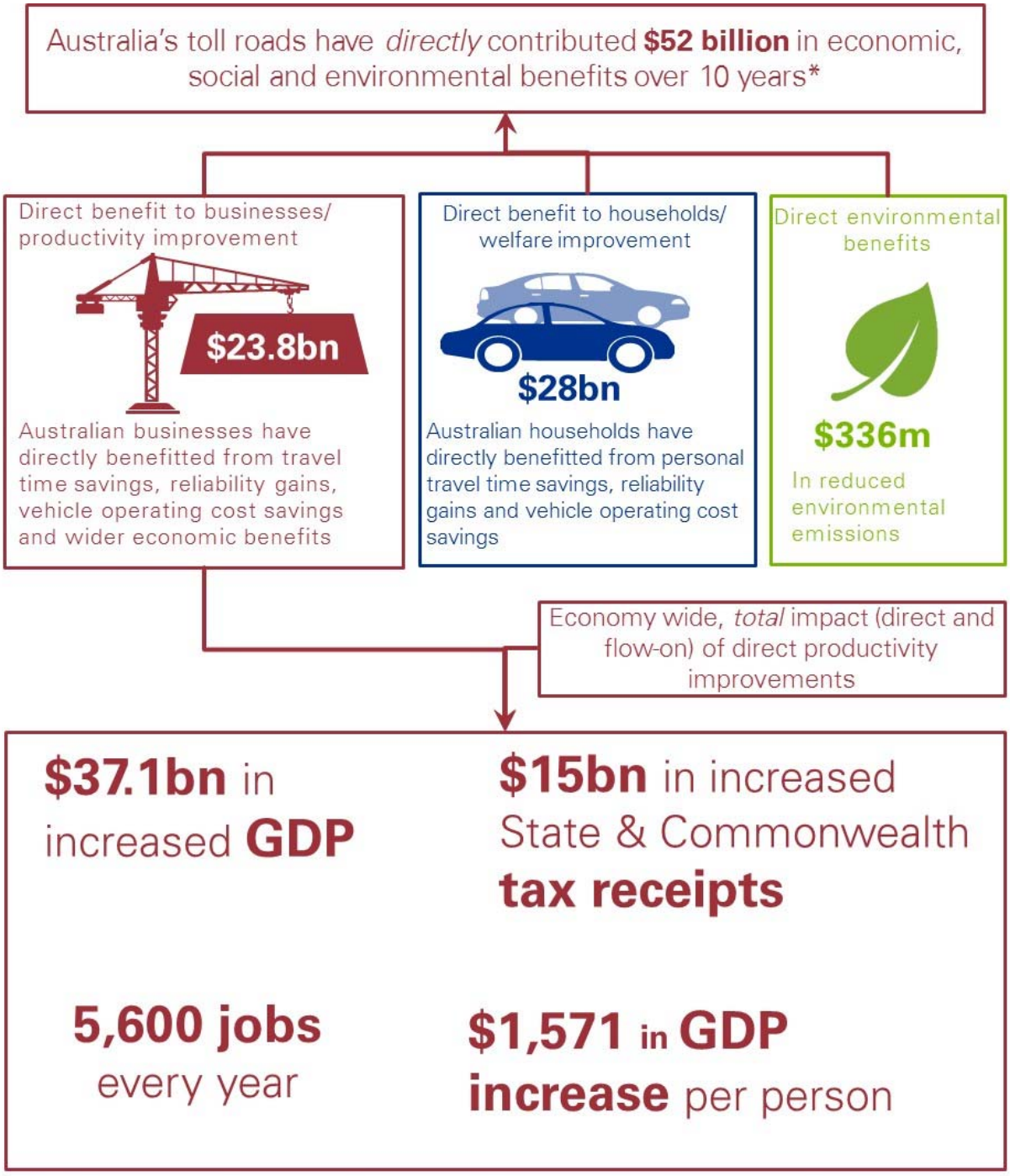
As noted on page 15 and Appendix C, the economic analysis undertaken in this report considers the accrual of benefits to users of the *toll roads only* (i.e. how much time and vehicle operating costs they save) but not the additional congestion that would be caused by these users if they all changed to using the non-tolled network.

This shift would potentially result in (even greater) congestion in each city, causing travel patterns and land use to change. Identifying these changes and incorporating them within our analysis was not feasible to model within the traffic models. However, non-inclusion of these broader dis-benefits, our analysis could be deemed conservative.

Moreover, the limitations with traffic modelling data has meant that a number of welfare benefits including the full spectrum of environmental externalities as well as accident savings have not been quantified.

The estimated annual benefits of toll roads presented in this report is therefore considered highly conservative, and, could be interpreted as the minimum level of benefit attributable to the toll roads.

3.6 Conclusion and summary



* All $ values are reported in present value terms using Infrastructure Australia recommended real discount rate of 7 per cent, which equates to a nominal discount rate of 9.7 per cent.

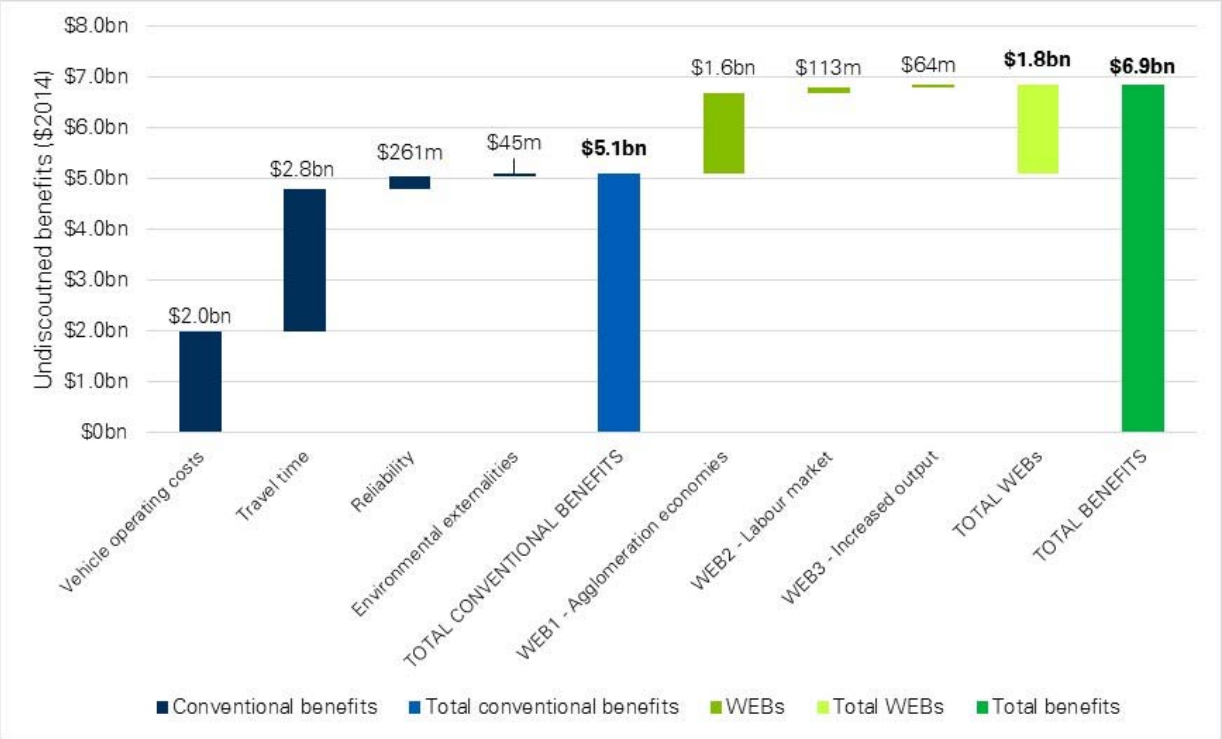
Australia currently has a total of 16 toll roads forming a mix of orbital and radial routes in Brisbane, Sydney and Melbourne. Some of these have been delivered by the public sector, whilst others have been delivered by the private sector under the PPP mechanism. Moreover, some of the toll roads originally developed by the government have been subsequently transferred to the private sector to operate and maintain.

The economic analysis undertaken in this study demonstrates that Australia's toll roads have significantly improved accessibility, and generated substantial economic and welfare benefits.

3.6.1 Annual benefits of toll roads

Overall, the economic and welfare contribution of Australia's toll roads has been estimated to be approximately $7bn per annum. The largest benefit is due to travel time savings, followed by vehicle operating cost savings. The third largest source of benefit is agglomeration economies, which is related to the changes in accessibility contributing to improvement in labour productivity.

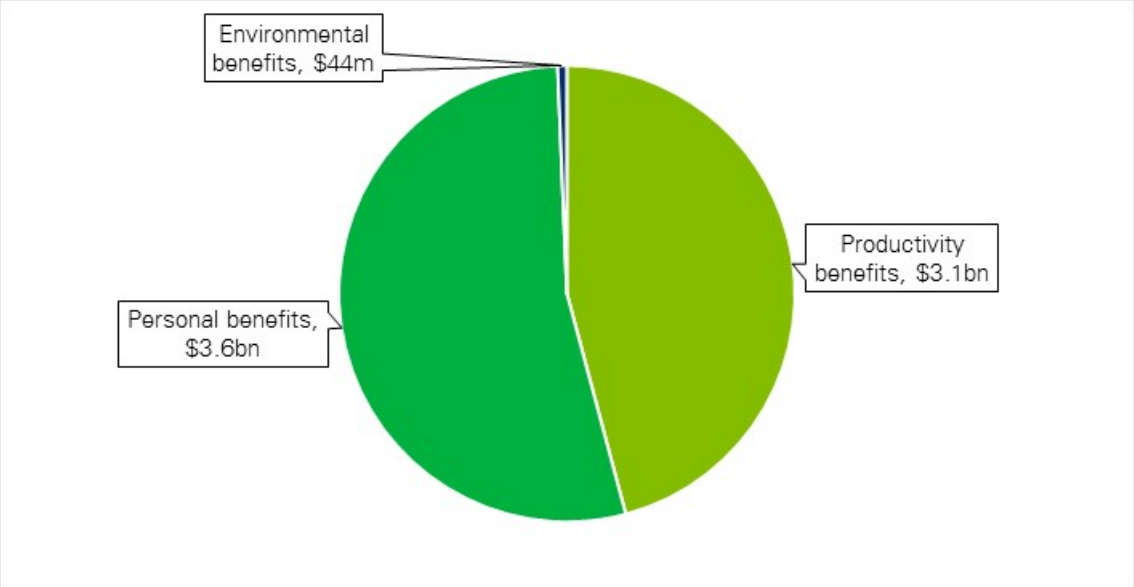
Figure 16: Annual economic benefits of toll roads in Australia



Source: KPMG analysis.

Figure 17 shows that just under half of the annual benefits (48%) of toll roads in Australia are productivity benefits, directly improving the standard of living of Australians.

Figure 17: Annual productivity benefits of toll roads in Australia



Source: KPMG analysis.

3.6.2 Beneficiaries of toll roads

Australia's toll roads have substantially increased accessibility to employment zones in Queensland, NSW and Victoria. The most pronounced effect is in Brisbane, where the Gateway Motorway, Gateway Extension Motorway and Logan Motorway connect major employment zones at Brisbane's airport, port and south-west industrial areas, leading to an almost doubling accessibility to these areas relative to non-tolled routes. The communities around the Bowen Hills portals of CLEM7 and AirportlinkM7 have also benefitted significantly from the delivery of the two toll roads.

The M5 South West and Westlink M7 Motorways in Sydney have enhanced the accessibility of south-west Greater Sydney around Campbelltown. Areas along the Westlink M7 corridor from Prestons to Baulkham Hills have also experienced accessibility improvements of 25 per cent on average. Eastern Distributor and Sydney Harbour Tunnel have enhanced the accessibility of the area around Sydney Airport by between 20 and 30 per cent.

In Greater Melbourne, the majority of the benefits of the toll roads have been realised by the north-west Melbourne (due to CityLink – Western Link), the communities along the M1 (Monash Freeway) corridor as well as the communities along the southern half of south-east Melbourne.

3.6.3 Economic contribution of accelerated delivery of toll roads

Table 7 shows the foregone benefits had delivery of Australia's toll roads been delayed by 10 years. Overall, the foregone benefits from a 10-year delay is estimated to be approximately $52 billion in present value terms. Of this total, approximately $24 billion is attributable to direct productivity benefits.

CGE modelling reveals that the total economic contribution of the timely delivery of the existing toll roads in Australia is equivalent to $37 billion of GDP (in present value terms) and supported 5,600 jobs per annum. This increase in economic activity contributed to State and Commonwealth tax receipts being higher by $15 billion in present value terms. The additional tax receipts could be used to deliver an equivalent of 8 Sunshine Coast Public University Hospital 'type' medical facilities, or 1,250 additional secondary colleges.[28]

[28] KPMG estimate based on http://www.lendlease.com/scuh and Victorian Government 2014-15, Budget Paper No.4

Table 7: Benefits of 10-year accelerated delivery time – all Australian toll roads, Present value

Present value over 10 years		QLD[29]	NSW	VIC	Australia
1	**Benefits to business and freight users**	**$6.1b**	**$2.8b**	**$1.6b**	**$10.5b**
1a	Vehicle operating cost savings	$3.2b	$1.5b	$0.9b	$5.6b
1b	Travel time savings	$2.6b	$1.2b	$0.6b	$4.3b
1c	Travel time reliability benefits	$0.3b	$0.1b	$0.1b	$0.5b
2	**Benefits for personal users[30]**	**$16.5b**	**$7.1b**	**$4.2b**	**$27.8b**
2a	Vehicle operating cost savings	$5.5b	$2.5b	$1.4b	$9.5b
2b	Travel time savings	$10.0b	$4.2b	$2.5b	$16.8b
2c	Travel time reliability benefits	$0.9b	$0.3b	$0.2b	$1.5b
3	**Other benefits**	**$0.2b**	**$0.1b**	**$0.1b**	**$0.3b**
3a	Environmental externalities	$0.2b	$0.1b	$0.1b	$0.3b
4=1+2+3	**TOTAL CONVENTIONAL BENEFITS**	**$22.8b**	**$9.9b**	**$5.9b**	**$38.6b**
5	WEB1 – Agglomeration economies	$5.8b	$3.7b	$2.5b	$12.0b
6	WEB2 – Labour market deepening	$0.4b	$0.3b	$0.2b	$0.9b
7	WEB3 – Increased output	$0.3b	$0.1b	$0.1b	$0.5b
8=5+6+7	**TOTAL WIDER ECONOMIC BENEFITS**	**$6.5b**	**$4.1b**	**$2.8b**	**$13.3b**
9=4+8	**TOTAL BENEFITS**	**$29.2b**	**$14.0b**	**$8.6b**	**$51.9b**
10=1+8	Productivity benefits	$12.6b	$6.9b	$4.4b	$23.8b
11=CGEx10	Gross Domestic Product	$19.4b	$9.5b	$5.5b	$37.1b*
12=CGEx10	Gross Domestic Product per capita	$4,098	$1,263	$943	$1,571*
13=CGEx10	Annual employment	3,100	1,200	860	5,600*
14=CGEx10	Change in capital stock	0.83%	0.21%	0.16%	0.29%*
15=CGEx10	State and Commonwealth tax receipts	n/a	n/a	n/a	$15b

*Source: KPMG analysis. Monetary values presented in Q2 $2014. Monetary values discounted at 7% *Economic impact results for QLD, NSW and VIC will not add up to that presented in Australia. Some economic gains from the toll roads operating in QLD, NSW and VIC also accrue to other states which is not presented here.*

[29] Economic benefits attributable to toll roads in Queensland is relatively higher than NSW and Victoria. This is because of the nature and function of the toll roads as well as the land use in Queensland. As noted in Section 3.1.3 the Gateway Bridge functions as a major river crossing in Brisbane (the next best non-tolled alternative being the Storey Bridge). The Gateway Bridge connects two large employment bases either side of the Brisbane River – the airport to the north, and the Port of Brisbane to the south of the river. Furthermore, the Gateway and Logan motorways connect major employment hubs at the Brisbane Multimodal Terminal and the South West Industrial Precinct.

[30] Consistent with the NGTSM Productivity Metrics paper, personal travel time, vehicle operating costs and reliability benefits are not included in the productivity benefits. Refer to Appendix, Section C.3.2 for further detail on productivity metrics.

Glossary

Acronym	Term
3Ps	Population growth, labour-force participation rate and productivity
B2BEd	Business to Business Effective Density
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CBA	Cost-Benefit Analysis
CBD	Central Business District
CGE	Computable General Equilibrium
CPI	Consumer Price Index
DEC	Direct Economic Contribution
GDP/GSP	Gross Domestic Produce/Gross State Product
HCV	Heavy commercial vehicles
IA	Infrastructure Australia
NGTSM	National Guidelines for Transport System Management
NPV	Net Present Value
NSW	New South Wales
RBA	Reserve Bank of Australia
PPPs	Public Private Partnerships
QLD	Queensland
TEC	Total Economic Contribution
Vic	Victoria
VOC	Vehicle Operating Costs
WEBs	Wider Economic Benefits
WEB1	Agglomeration economies
WEB2	Labour market deepening
WEB3	Increased output due to imperfect competition

Appendix A Transport and the economy

A.1 Role of transport

Transport, together with urban form, are critical elements that facilitate mobility. Transport infrastructure, whether it be road, rail, or bicycle paths, provides the community with access to a wide range of economic, social and cultural activities. Transport also provides businesses with access to other businesses and customers, and residents with access to employment. ***"A good transport network is important in sustaining economic success in modern economies: the transport system links people to jobs; delivers products to markets; underpins supply chains and logistics networks; and is the lifeblood of domestic and international trade".***[31]

A recent analysis undertaken by Infrastructure Australia assessed that amongst all economic infrastructure, transport accounted for the largest direct economic contribution (DEC) in the Australian economy. When provided in the 'right' areas to address congestion 'pinch points' and facilitate economic growth, transport can be a major driver of prosperity. Infrastructure Australia estimates that urban transport alone accounted for $80 billion of DEC in 2011, nearly 40 per cent of all infrastructure value-add. Urban and non-urban transport delivered an estimated $131 billion of DEC in 2011, close to 70 per cent of all infrastructure value-add and 11 per cent of GDP.[32]

Figure 18: Infrastructure value-add by DEC in 2011 ($ million)

Source: Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Figure 1; KPMG Analysis. Note: Figures are in 2011 dollars ($ million)

[31] UK HM Treasury (Dec 2006) The Eddington Transport Study: The Case for Action p.11
[32] Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Figure 1 and KPMG analysis.

A.2 Road transport

The largest component of transport infrastructure is comprised of roads. Infrastructure Australia estimates that the DEC of urban roads in 2011 was $70 billion, with an additional $9.5 billion DEC from national highways.[33] In NSW, the DEC of urban roads was $27.5 billion, while in Victoria it was $20 billion and in Queensland it was $13 billion. In Western Australia, South Australia and Tasmania it was $9 billion, $6 billion and $835 million, respectively.[34] By these estimates, roads accounted for 88 per cent of all urban transport value-add in 2011.

Table 8: Overview of national infrastructure by sector in 2011 – urban transport

Sector	Direct Economic Contribution
Urban roads	$70,268m
Urban passenger rail	$4,216m
Bus	$3,411m
Light rail/tram	$18m
Total Urban Transport	**$79,685m**

Source: Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Table 7; KPMG Analysis
Note: Dollars are in 2011 dollars.

Table 9: Overview of national infrastructure by sector in 2011 – non-urban transport

Sector	Direct Economic Contribution
National highways	$9,499m
Freight rail	$5,426m
Ports	$20,655m
Airports	$20,677m
Total Non-Urban Transport	**$56,257m**

Source: Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Table 7; KPMG Analysis
Note: Dollars are in 2011 dollars.

The predominant beneficiaries of urban transport investment are cars, followed by heavy vehicles and urban rail. In 2011, the DEC of cars' access to transport was $62.5 billion across the six capital conurbations.[35] In all cities except Melbourne, the next most benefitted mode of transport was heavy commercial vehicles (HCV), which benefited from transport infrastructure by close to $5 billion; followed by urban rail, which received a DEC benefit from transport investment close to $4 billion in 2011.[36]

[33] Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Table 7
[34] Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.2, Table 33, 43, 53, 62, 71 & 80
[35] Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Table 10
[36] Ibid

Table 10: Urban transport by DEC by mode

Urban area	Car	LCV	HCV	Rail	Bus	Ferry	Light Rail	Total
Sydney/ Newcastle/ Woolongong	$20.53bn	$854m	$2.83bn	$1.95bn	$1.33bn	$4m	$12m	$27.5bn
Melbourne/ Geelong	$15.54bn	$641m	$779m	$1.74bn	$985m	N/A	$322m	$20bn
Greater Brisbane	$11.43bn	$528m	$516m	$190m	$398m	$14m	N/A	$13.08bn
Perth	$7.65bn	$400m	$448m	$290m	$350m	<$1m	N/A	$9.13bn
Adelaide	$5.83bn	$194m	$383m	$42m	$254m	N/A	$1m	$6,71bn
Canberra	$1.5bn	$51m	$175m	N/A	$95m	N/A	N/A	$1,82bn
Total	**$62,47bn**	**$2.67bn**	**$5.13bn**	**$4.22bn**	**$3.41bn**	**$18m**	**$335m**	**$78.25bn**

Source: Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, Table 10. Note: IA analysis only considers the six largest capital cities. Figures are reported in 2011 prices

The importance of roads is also demonstrated by the passenger kilometres travelled and goods tonnage shipped. Over 90 per cent of passenger transport in urban areas was undertaken by road in 2009-10. Roads also accounts for all urban freight tasks and around one-third of inter and intra-state freight task.

Table 11: Australian passenger (billion passenger kilometres) and freight (billion tonne kilometres) travel, 2009-10

Journey type	Road	Rail	Shipping /Ferry	Total
Urban passenger	170.4 (93%)	12.1 (7%)	0.16 (0.1%)	182.6
Total Passenger (Urban and Non-Urban)	**282.3 (72%)**	**14.74 (4%)**	**N/A**	**394**
Urban freight	41.5 (100%)	N/A	N/A	41.5
Intra-state freight	118.7 (31%)	231 (60%)	34.1 (9%)	383.8
Inter-state freight	66.7 (38%)	27.6 (16%)	80.6 (46%)	175
Total Domestic Freight	**185.4 (33%)**	**258.6 (46%)**	**114.8 (21%)**	**558.8**

Source: Based on BITRE (2014) Australian Infrastructure Statistics Yearbook; KPMG Analysis Note: Figures are expressed in billion passenger kilometres and billion freight tonne kilometres. 2009-10 is the most recent year for which all figures are available; values may not sum because air freight is excluded.

A.3 Challenges facing Australians in the transport sector

There are a number of challenges facing transport infrastructure in Australia. Rapidly growing population in Australian cities and economic growth are generating significant demand for transport, exacerbating existing congestion. Conversely, the fiscal constraints facing the governments at all levels are constraining the ability of the public sector to fund projects and/ or implement policy measures that could address congestion.

A.3.1 Rapidly growing congestion

Despite Australian cities having relatively smaller populations than many international counterparts, their residents spend a disproportionately large amount of their time in traffic. The analysis using TomTom data provided in Figure 2 demonstrates that relative to the population, residents of Australian cities spend relatively higher proportion of time in traffic when compared to cities such as London, Paris, Chicago and Los Angeles.

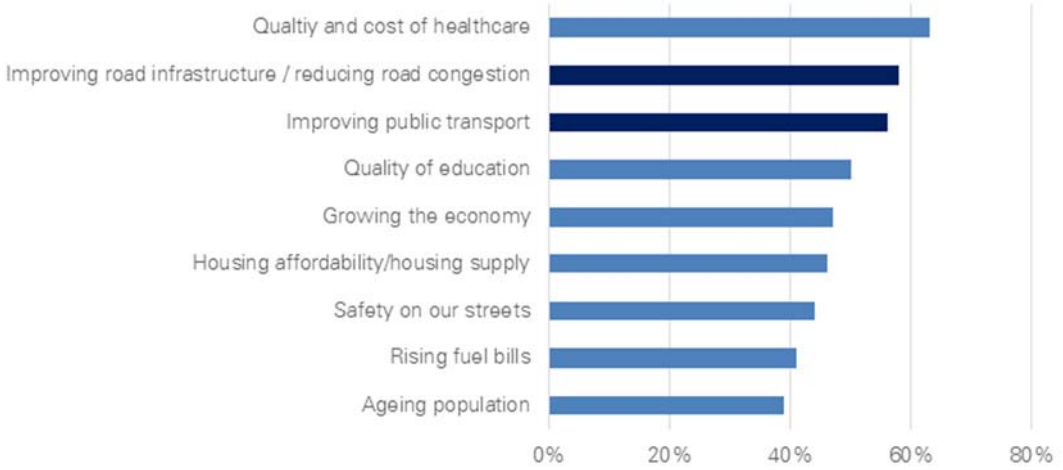
The impact congestion is having on the economy is being noticed by institutions and the community alike. For instance, the Productivity Commission Inquiry into Public Infrastructure in 2014 reported that there are "***widely held views that deficiencies in certain aspects of Australia's infrastructure — such as in roads, rail, and ports — are holding back productivity growth and affecting the amenity of our cities and regional areas. This gives rise to concerns about an overall infrastructure deficit".***[37]

Further, the Reserve Bank of Australia (RBA) Deputy Governor Philip Lowe commented on the declining productivity growth in Australia and concluded that efficient infrastructure can help reverse this trend.[38]

Commuters are similarly concerned about congestion. A consumer survey conducted by EY Sweeney in 2014 on "key issues requiring Government leadership and action in Sydney, Melbourne and Brisbane" found that improving road infrastructure/reducing road congestion and improving public transport were seen as the second and third most important issues requiring government action. Improving transportation ranked ahead of education, the economy and housing affordability.

[37] Productivity Commission (2014) Public Infrastructure, Inquiry Report No. 71, May 2014, p.3
[38] Lowe, P. (2013) '*Productivity and infrastructure*', presented at IARIW-UNSW Conference on Productivity Measurement, Drivers and Trends, Sydney

Figure 19: Key policy issues – survey results



Source: Transurban (2015) www.transurban.com/files/Factsheet_User_pays.pdf

A.3.2 Infrastructure deficit

A primary barrier to addressing Australia's congestion problem is the significant infrastructure 'deficit' facing most Australian cities. Transport infrastructure is inherently challenging to fund. Major transport projects have a long gestation period of around 10 years on average, entail large up-front costs and have a long pay-back period. For this reason, government has historically been the primary financer of major infrastructure, and has utilised its extensive revenue base and borrowing capacity to deliver road investments.

Competing budgetary priorities are one of the key reasons behind the under-investment in in infrastructure in Australia. Infrastructure Australia has identified a number of "Infrastructure Gaps" in its Infrastructure Audit Report, including:

- Gaps in service quality, particularly in urban transport;
- Gaps between expectations about infrastructure quality, and the willingness or ability to pay. Infrastructure Australia anticipates that serious public discussion about infrastructure service levels and funding will be necessary to reconcile these expectations; and,
- Gaps between infrastructure performance in Australia and Australia's international peers, particularly around infrastructure effectiveness and quality.[39]

Infrastructure Australia notes that public investment in road and rail has declined as a proportion of GDP since 2012, and Government will struggle to maintain current levels of infrastructure spending in the medium term,[40] thereby further widening the infrastructure gap.

It is unlikely that the infrastructure gap will be addressed under current policy settings. Analysis of state road authority planning documents and departmental infrastructure strategies indicate that at least 16 proposed road infrastructure projects in QLD, NSW and Victoria are currently being planned/mooted, but remain unfunded[41].

[39] Infrastructure Australia (2015) Australian Infrastructure Audit Report, Vol.1, p.7
[40] Infrastructure Australia (2015) Australian Infrastructure Audit Report, Executive Summary, p.13
[41] Infrastructure Australia (IA) adopted a 'top-down' approach to identify congested corridors across Australian cities. As acknowledged by IA, the IA modelling provides one approach to measuring and projecting demand for transport infrastructure. State governments may utilise other, locally specific, fine-grain data and different methods of analysis, to

Table 12: Select planned road infrastructure in Queensland (2014-15, $ 2012-13 dollars)

Project	Estimated cost	Status
Brisbane transit ways	$116m	*Funded*
Gateway upgrade north	$1.3bn	*Funded*
Ipswich Motorway – Rocklea to Darra	$558m	*Planned/mooted*
Wynnum Road corridor upgrade	–	*Planned/mooted*
Toowoomba second range crossing	$1.6bn	*Funded*
Bruce Highway upgrade	$590m	*Funded*
Funded	**$3.6bn**	***4 projects***
Planned/mooted	**$558m**	***2 projects***

Source: Infrastructure Australia "Projects"; Queensland Government (2015) Department of Transport and Main Roads; KPMG Analysis.

Table 13: Select planned road infrastructure in Victoria (2014-15, $ 2012-13 dollars)

Project	Estimated cost	Status
EastWest link – Stage 1 eastern Section*	$6 – 8bn	*Planned/mooted**
Level crossing removal	$4 – 5bn	*Planned/mooted*
CityLink Tullamarine widening project	$1.28bn	*Funded*
M80	$2.25bn	*Funded*
West Gate distributor – labour freight upgrade	$400 – 500m	*Planned/mooted*
Western Distributor – Transurban proposal	$5.5bn	*Planned/mooted*
Bulla Bypass	$176 – 245m	*Planned/mooted*
Cardinia Road upgrade	$2.7m	*Funded*
Chandler Highway widening	$110m	*Planned/mooted*
Dingley Bypass	$156m	*Funded*
High Street Road upgrade, Wantirna South	$16.2m	*Funded*
Hoddle Street – streamlining initiative	$250m	*Planned/mooted*
Monash Freeway managed motorway	$19.7m	*Funded*
Mordialloc Bypass	$10.6m	*Planned/mooted*
Narre Warren-Cranbourne road	$49m	*Funded*
Western Port Highway	–	*Planned/mooted*
Funded	**$2.5bn**	***6 projects***
Planned/mooted	**$20.9bn**	***11 projects***

Source: Infrastructure Australia "Projects"; Victorian Department of Economic Development, Jobs, Transport and Resources (2015) Transport; VicRoads (2015) Project database; DEDJTR (2015) CityLink Tulla Widening; ALP (2014) Project 10,000; KPMG Analysis.

**East West Link – Eastern Section is not assessed as a priority project by the Victorian government but remains part of long term infrastructure plan for Victoria.*

inform identification of infrastructure priorities. Consequently, the infrastructure priorities identified by the State governments may not directly match the congested networks identified by IA.

Table 14: Select planned road infrastructure in NSW (2014-15, $ 2012-13 dollars)

Project	Estimated cost	Status
Pacific Highway corridor upgrade	$6.4bn	*Funded*
F3 widening – Tuggerah to Doyalson	$200m	*Planned/mooted*
WestConnex	$15bn	*Partially funded*
Western harbour tunnel	$4.5bn	*Planned/mooted*
Expanded clearways	$100m	*Planned/mooted*
Smart motorways: M4 West	$400m	*Planned/mooted*
SCATS & transport management centre	$200m	*Planned/mooted*
Funded	**$21.4bn**	***2 projects***
Planned/mooted	**$5.4bn**	***5 projects***

Source: Infrastructure Australia "Projects"; NSW RMS (2014) State Infrastructure Strategy; KPMG Analysis

A.3.3 Government budgetary challenges

Infrastructure funding has traditionally been the responsibility of Australian governments. In the period leading up to 1980s, almost all major road projects were funded through state and territory capital expenditure, Commonwealth contributions and public debt. Tolls were levied on select road projects by governments and paid into consolidated revenue to recoup costs and service the debt.

Between 2003 and 2014, Commonwealth expenditure grew from 19 per cent to 21 per cent of GDP, while state expenditure remained constant.[42] Over the same period, Commonwealth revenue fell from 22 per cent of GDP to 20 per cent,[43] resulting in the Commonwealth budget transitioning from a surplus to a deficit.

Further, the growth in government expenditure has been concentrated in areas of social welfare, health and education. Spending in non-infrastructure areas is also projected to grow significantly due to the ageing population and growing dependency ratio.

In addition to the cash position of government deteriorating, we also note that in 2013-14, only 7 per cent of Commonwealth and State government spending was targeted towards infrastructure,[44] and even in nominal terms, capital expenditure is forecast to decline from $15 billion in 2014 to approximately $8 billion in 2017.[45]

[42] Daley, J., McGannon, C., and Hunter, A. (2014) Budget pressures on Australian governments, p.15
[43] Ibid, p.15
[44] Ibid, p.16
[45] Ibid, p.38

Appendix B Toll roads in Australia

Toll roads have existed in Australia since 1811 when Governor Macquarie, through a decree, awarded the right to the private operator to collect tolls in return for the operator constructing and maintaining the Sydney to Parramatta road for 10 years. In the 1980s a number of toll roads were delivered in Australia (e.g. Sunshine Motorway; Logan Motorway; Gateway Bridge One; and, Sydney Harbour Tunnel) and in the 2000s (e.g. Gateway Bridge Two; Go Between Bridge; CLEM7; AirportlinkM7; Cross City Tunnel; Lane Cove Tunnel, Westlink M7 (NSW); and, EastLink (Vic).

Historically, toll roads were developed, operated and tolled by the Government. The Sydney Harbour Bridge, for example, was developed by the NSW Department of Public Works and operated after 1932 by the Department of Main Roads.[46] To this day, Sydney Harbour Bridge toll revenue is collected by the Government.

An increasing number of toll roads are now co-funded and operated by private providers. A major turning point was in 1992 when the Victorian Government announced that Transurban would develop the 22km CityLink toll road. Transurban designed and constructed the project with the financial support of the Victorian Government, private equity and infrastructure bonds.[47]

B.1 Toll roads in Queensland

Queensland has a number of toll roads across its transport network, although these are largely concentrated around Brisbane river crossings and areas adjacent to the CBD.

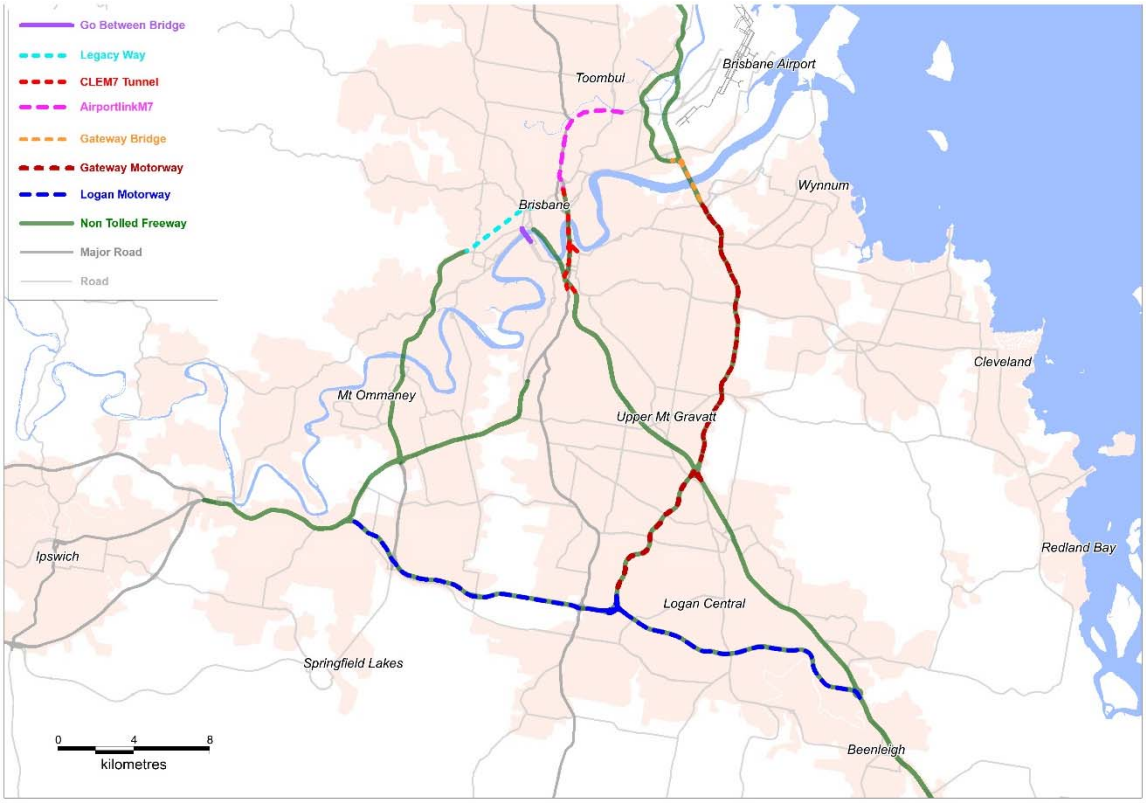
The first Queensland toll road was the Brisbane Bridge (later named Victoria Bridge) which was completed in 1865, 67 years before the opening of the Sydney Harbour Bridge. The bridge was funded through debt issued by the Bank of Queensland to the government, and tolls were collected by the government to service the debt.[48]

In the 1980s, the Sunshine and Logan Motorways were developed to better connect the major activity centres outside the Brisbane CBD. The projects were funded through PPPs with the Sunshine Motorway Company and Logan Motorways Limited. The Sunshine Motorway has since reverted to State ownership and is now un-tolled. The Logan Motorway is currently operated by Transurban as a toll road.

The next major suite of toll roads was developed as part of the TransApex strategy in Brisbane in the 2000s. The strategy proposed a series of road infrastructure tunnel projects to create a ring road around the city, provide an alternative route for cross-city trips, and ease congestion in the CBD.[49] To date, the Queensland Government has delivered the AirportlinkM7, CLEM7, the 'Go Between' Bridge and the Legacy Way (opened in June 2015) recommended in the strategy.

[46] NSW State Records – Sydney Harbour Bridge Branch [Department of Public Works]; accessed on 19 May 2015 at http://search.records.nsw.gov.au/agencies/1898
[47] Transurban (2000) Transurban City Link Limited – Annual Report 2000
[48] Queensland Legislative Assembly (1868) Hansard – The Brisbane Bridge Bill, 23 January 1868
[49] Brisbane City Council (2005) TransApex Prefeasibility Report, p. viii

Figure 20: Toll roads in Queensland, 2015



Source: KPMG

CLEM7 and the AirportlinkM7 project were assessed as strategic priorities for the Queensland Government. Developed and contracted during the positive economic climate of the early-mid 2000s (CLEM7 was awarded to RiverCity Motorway in 2006, and AirportlinkM7 was awarded to BrisConnections in 2008), the funding structures for both projects adopted high levels of debt and projected optimistic revenue streams based on high-volume traffic forecasts. Initially, both roads proved financial 'failures' due to actual traffic falling well below the forecasts. Coupled with high leverage and the global financial crisis, the project operators found themselves unable to service their debt. In 2011, RiverCity Motorway went into receivership, and BrisConnections was put into voluntary administration in February 2013, seven months after the opening of the AirportlinkM7.

Some toll roads (specifically CLEM7 and AirportlinkM7) experienced significant revenue challenges due to optimistic traffic forecasts. These projects however have delivered high-quality roads at little cost to government. These brownfield assets are now increasingly attractive to the private sector. The CLEM7 asset was successfully sold by the receiver in 2013, and a sale process for the AirportlinkM7 is expected to commence later this year.

Table 15: Toll roads in Queensland, 2015

	Project	Opened	Purpose	Financing	Length
Past	Brisbane /Victoria Bridge	1861,1874, 1897,1969	Facilitate cross-river commerce	Public	313m (current)
	Story Bridge	1940	Facilitate cross-river commerce and alleviate congestion	Public	777m
	Sunshine Motorway	1993	Provide safe, reliable time and cost savings	PPP with 30 year franchise	33km
Current	Logan Motorway	1988	Link the Pacific and Gateway Motorways	PPP with 30 year franchise	38.7km
	Gateway Motorway	1986 & 2011	Facilitate access to Gold Coast and Sunshine Coast	PPP	23.1km
	Go Between Bridge	2010	Improve cross river accessibility, congestion and pedestrian access	Public financing, private toll operation	300m
	CLEM7 Tunnel	2010	Divert traffic from the CBD and ease congestion	PPP	6.8km
	AirportlinkM7	2012	Direct link to airport and ease congestion	PPP	6.7km
	Legacy Way	June 2015	Connect the Western Freeway at Toowong with the Inner City Bypass	PPP	5.7km

Source: Queensland Heritage Register (1992) Former Victoria Bridge Abutment; Institution of Engineers Australia (1988) The Story Bridge: Traffic & Planning Aspects, vol.29 no.4, p.17; Sunshine Motorway Company (1994) 1994 Annual Report, p.2-3; Transurban (2014) 2014 Transurban Annual Report; Brisbane City Council (2014) Go Between Bridge history; DIT (2011) GHD Report; BrisConnections (2013) AirportlinkM7 Traffic – December 2012 (ASX release); Transcity Website (2015); Transurban Investor Presentation (February 12, 2015) and KPMG Analysis.

B.2 Toll roads in NSW

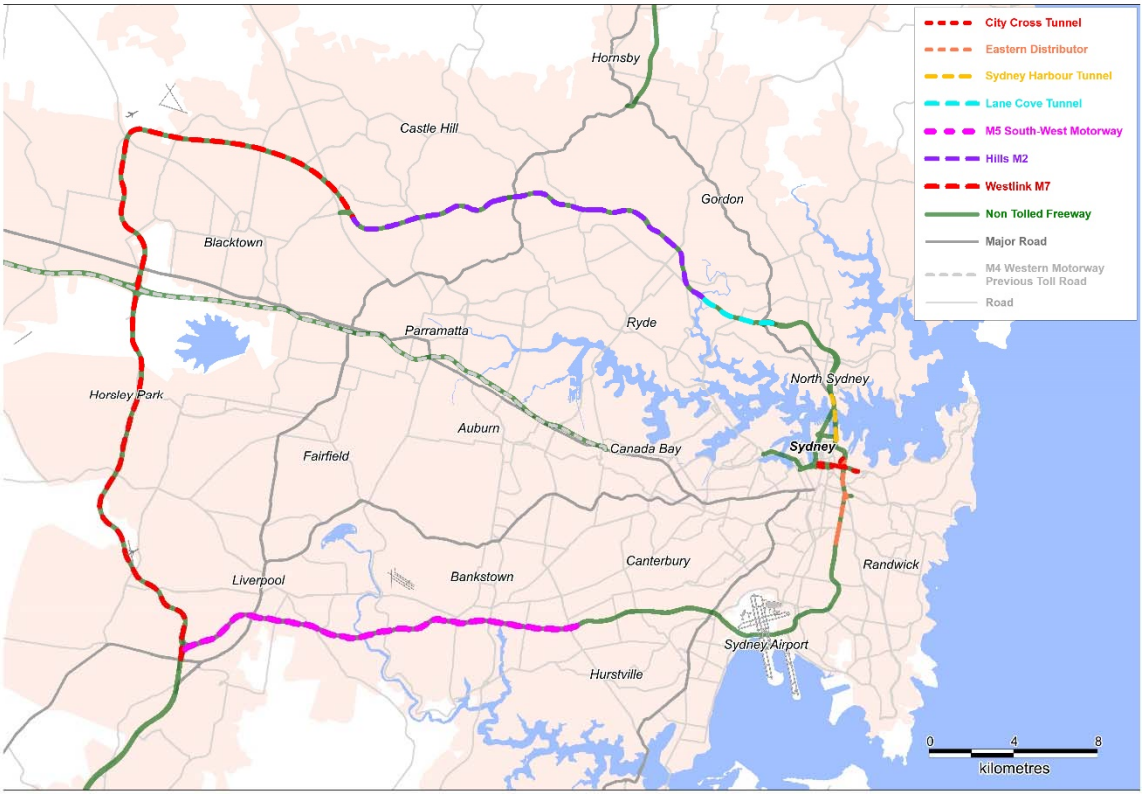
NSW has the most extensive network of toll roads in Australia, totalling 140 kilometres of road network in 2015. Toll roads were employed early in the history of Sydney. In 1811, Governor Macquarie issued a proclamation that a toll be levied on transit through the Sydney to Parramatta turnpike "in order to render the public highway… perfectly safe and commodious".[50]

The Sydney Harbour Bridge in 1932 was the first major toll road in NSW. The bridge was developed to connect the city to the north shore, extend the railway from the new Central station and "give an idea of strength and magnificence that would reflect credit and glory on the colony and the Mother Country."[51] The bridge was funded in large part by NSW Government debt.[52] The government intended to repay the debt through tolls, a betterment tax on properties adjacent

[50] NSW State Records (2010) Regulations and tolls for the turnpike road – 30 March 1811
[51] NSW State Records (2003) Archives In Brief 37 – A brief history of the Sydney Harbour Bridge; NSW State Records (2003) Archives In Brief 38 – Records relating to the Sydney Harbour Bridge
[52] Grattan (2012) Can we afford to get our cities back on the rails? p.13

to the bridge, and funding drawn from the railways budget.[53] The bridge continues to be tolled, and is owned and operated by the NSW Government.

Figure 21: Toll roads in NSW, 2015



Source: KPMG

Between the 1960s and 1970s, toll roads were developed in regional NSW to connect the City of Sydney to Wollongong, Newcastle and the Blue Mountains. The M4 Western Motorway was opened in stages between the 1960s and 1990s. In 1989, Statewide Roads won the right to develop and operate the remaining sections of the M4 under a concessional agreement. The M4 toll ended in 2010 and ownership reverted to the State Government.[54]

The F6 Princes Motorway linking Sydney to Wollongong was first opened in 1975 and attracted a toll to repay the debt issued to deliver the project. The Princes Motorway had repaid its debt by 1995 and the toll was removed.

In the 1990s and 2000s, key links in the Sydney road network were completed as toll roads. The Sydney Harbour Road Tunnel was opened in 1992 under a PPP arrangement, with the Sydney Harbour Tunnel Company who continues to operate and toll the Harbour Tunnel.[55] Further road expansions were made as part of the Sydney Orbital plan, funded in part by private finance and recouped using tolls. These included the South-West Motorway in 1992, the Hills Motorway in

[53] Ibid, p.13
[54] NSW RMS (2014) M4 Western Motorway, accessed on 19 May 2015 at http://www.rms.nsw.gov.au/roads/using-roads/motorways-tolling/m4-western/index.html
[55] NSW RMS (2014) Harbour Tunnel, accessed on 19 May 2015 at http://www.rms.nsw.gov.au/projects/sydney-inner/harbour-tunnel.html

1997, the Eastern Distributor in 1999, and the Westlink M7 and the Cross City Tunnel in 2005.[56] The Sydney Orbital was completed in 2007. Transurban has interests in all these toll roads.[57]

Table 16: Toll roads in NSW, 2015

	Project	Opened	Purpose	Financing	Length
Past	Western Motorway	Various	Better connect Sydney with the Blue Mountains	PPP	46km
	Princes Motorway	1975	Better connect Sydney to Wollongong	Public	53km
	Pacific Motorway	1963	Better connect Sydney with Newcastle	Public	127km
Current	Sydney Harbour Bridge	1932	Connect the city to the north shore and extend the rail line	Public	1.1km
	Sydney Harbour Tunnel	1992	Ease congestion on the Sydney Harbour Bridge	PPP	2.7km
	Cross City Tunnel	2005	Ease cross harbour congestion	PPP	2.1km
	Eastern Distributor	1999	Link the Sydney CBD to Sydney Airport via Southern Cross Drive	PPP	6km
	Hills M2	1997	Link the Western Suburbs to the CBD, and ease congestion in Parramatta	PPP	21.4km
	Lane Cove Tunnel /MRE	2007	Ease congestion in the north west of Sydney and complete the Sydney Orbital	PPP	3.6km
	M5 South Western Motorway	1992	Provide a route from Liverpool to the CBD, ease congestion and improve traffic flow	PPP	22km
	Westlink M7	2005	Connect Blacktown to Liverpool and support a future second Sydney Airport	PPP	40km
Future	NorthConnex	2019 (Planned)	Provide a direct, freeway quality connection between the M1 and M2	PPP	9km
	WestConnex	Not available	Connect southern suburbs to the CBD	PPP	33km

Source: Transurban (2014) 2014 Transurban Annual Report, NSW Joint Select Committee on the Cross City Tunnel (2005); KPMG Analysis.

[56] NSW RMS (2014) Sydney Motorways, accessed on 19 May 2015 at http://sydneymotorways.com/about.html
[57] Transurban (2015) Traffic and revenue data – December 2014 (ASX release)

B.3 Toll roads in Victoria

Historically, Melbourne has addressed congestion challenges through a mix of investment in public transport infrastructure and publicly funded road projects.

The first major toll road in Melbourne was the West Gate Bridge, completed in 1978. The bridge is the primary road linkage to western Melbourne, and the only large arterial road over the mouth of the Yarra River. As a result, the bridge is a pivotal resource for many in the western suburbs to access employment and recreational opportunities. In 1985, the State government removed tolls from the West Gate.

CityLink, which was completed in 1999, was the next major road that was tolled in the State and was the first road infrastructure developed under a PPP arrangement in Victoria. The road connects the north-west and south-eastern suburbs, as well as provides access to the city centre. CityLink was the first toll road to employ electronic payment (via e-TAG) which allows motorists to pay tolls without needing to stop and disrupt the flow of traffic.

Figure 22: Toll roads in Victoria, 2015

Source: KPMG

The most recent arterial road projects, EastLink (2008) and Peninsula Link (2013), were delivered through a PPP but under different models. Tolls are charged on EastLink, while the Peninsula Link operates under an availability payment arrangement and is 'toll-free' to users. The EastLink and the Peninsula Link together facilitate passenger movement and freight access in the eastern suburbs of Melbourne.

Table 17: Toll roads in Victoria, 2015

	Project	Opened	Purpose	Financing	Length
Past	West Gate Bridge	1978	Primary road linkage connecting western Melbourne to rest of Melbourne	Public	2.5km
Current	CityLink	1996	Connect the north west and south east suburbs	PPP	22km
	EastLink	2005	Improve eastern suburb and ring road connectivity	PPP	39km
Future	East-West Link	Indefinite hold	Alleviate congestion and improve CBD access	Indefinite hold (was proposed to be developed under PPP arrangement by the previous State Government)	18km
	Western Distributor	Not available	Connect the CBD to the western suburbs and West Gate Freeway. Provide alternative connection to the Port.	PPP	Not available, subject to detailed concept plan

Source: ConnectEast (2011) Annual Report 2011 Linking Melbourne Authority (2010) Project Summary – Peninsula Link; Transurban (2015); KPMG Analysis

Appendix C Assessing total economic contribution of toll roads

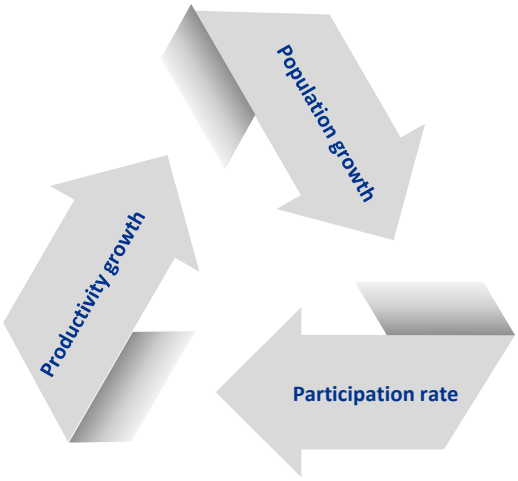
C.1 Economic growth and productivity

Over the last two decades, Australians have enjoyed significant growth in their standard of living. Average income levels have risen from around $40,500 in the early 1990s to around $66,400 today (in real terms).[58] Increase in real income gives people the capacity to buy the goods and services that they desire, save and invest for the future and more freedom to choose how they spend their time.[59] Rate of economic growth and income (Gross Domestic Product (GDP) or Gross State Product (GSP) per person) is one of the most important determinants of our living standard.

Whilst there are a number of factors that impact on the rate of economic growth and the Australian standard of living over the short term, over the medium to long term, three factors are critical in determining our economic growth (the 3Ps):

- population growth;
- labour-force participation rate; and
- productivity.

Figure 23: Drivers of economic performance over the long term, 3Ps



We briefly examine each of these factors to assess their potential impact on the Australian standard of living in the coming years.

[58] Commonwealth of Australia (March 2015) 2015 Intergenerational Report: Australia in 2055
[59] Ibid

C.1.1 Population

Australia's population is projected to exceed 40 million by 2061.[60] In the absence of any changes to participation and productivity, the GDP/GSP would be expected to grow in line with the rate of population growth. This in turn implies that our GDP/GSP per person (i.e. standard of living) would remain constant.

C.1.2 Participation

Australia's population structure is expected to change significantly, with the share of the working age population (aged 15 - 64) projected to decline from 67 per cent in 2012 to approximately 60 per cent by 2061. The share of persons 65 years and over is expected to grow from 14 per cent to above 20 per cent over the same period. This significant shift in Australia's demographics is expected to lower labour-force participation from 64.6 per cent to 62.4 per cent.[61]

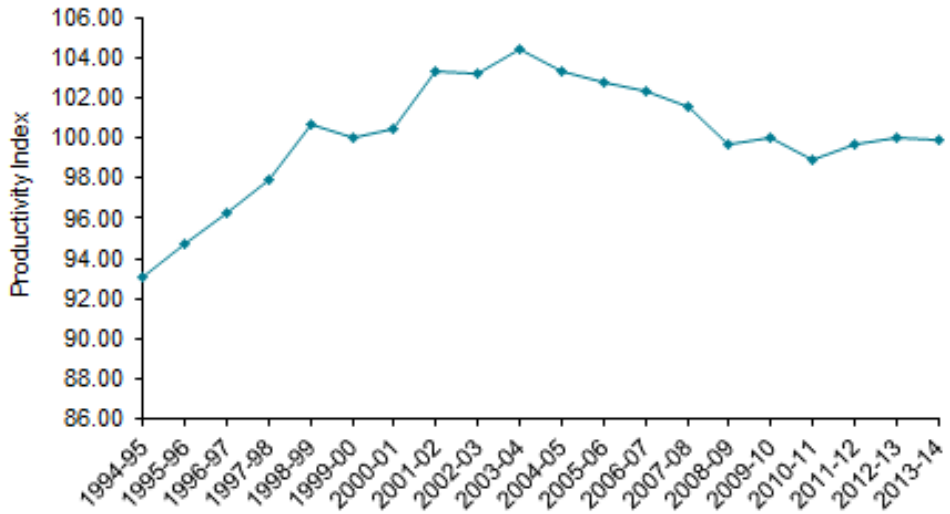
The decline in labour participation, in the absence of any growth in productivity, will therefore negatively impact on our standard of living.

C.1.3 Productivity

It is therefore imperative that Australia focus on enhancing economic productivity to ensure that we at least maintain, if not continue to raise, the standard of living.

Data on historical productivity growth, however, shows that this is likely to be challenging under current policy settings. Multifactor productivity (which provides a comprehensive measure of productivity and incorporates all inputs including labour, capital and other intermediate inputs) in Australia has been declining since the early 21st century, as shown below.

Figure 24: Multifactor productivity, quality adjusted hours worked basis, 1995-2014



Source: Data sourced from ABS, Estimates of Industry Multifactor Productivity, Cat: 5260.0.55.002

The continued decline in the productivity growth in Australia over the last decade, and the tangible impact it has on the standard of living, has contributed to increased public policy debate on potential approaches to reverse the trend and the critical role of infrastructure. This is briefly discussed in the next section.

[60] ABS, Population Projections, Series B
[61] Treasury projections as reported in Commonwealth of Australia, March 2015, 2015 Intergenerational Report: Australia in 2055

C.2 Transport and productivity

A range of studies, including those published by the Productivity Commission[62] and most recently Infrastructure Australia,[63] have noted the important role that transport plays in enhancing economic growth and productivity. ***Our roads, rail, ports and airports are all critical to the movement of people, goods and resources. When our transport and logistics networks work effectively, they raise productivity levels and strengthen the economy.***[64]

The Reserve Bank of Australia (RBA) Deputy Governor Philip Lowe in 2013 articulated the important role of infrastructure on productivity. Lowe observed the declining productivity growth in Australia and concluded that efficient infrastructure can help reverse this trend.[65] Transport networks enable efficient production of goods and services, allow businesses to access more customers (and vice versa), and improve the range of employment opportunities for workers,[66] By lowering transport costs, deepening markets and facilitating increased competition, transport networks can improve economies of agglomeration and contribute to innovation. ***Infrastructure decision making must place a high priority on productivity growth.***[67]

Given the significant impact transport has on productivity and economic growth, it is important that the approach used for assessing and evaluating transport projects and policies directly considers this impact. As noted by Infrastructure Australia in its recent Audit of Australian infrastructure, ***"this can only be achieved through efficient management of existing infrastructure, rigorous and disciplined evaluation of investment initiatives and efficient delivery of new project"***. [68]

C.3 Approach to assessing the total economic contribution

C.3.1 Economic assessment framework

Historically, transport projects have been assessed and prioritised using a conventional Cost Benefit Analysis (CBA) framework. The objective of the CBA is to identify project or policy options that enhance societal welfare from a utilitarian perspective.

For transport projects, conventional CBA typically entails quantification of travel time savings, vehicle operating cost savings, reliability benefits, environmental externalities and accidents.

Over the last few years, the concept of Wider Economic Benefits (WEBs) has entered the project evaluation framework for significant transport projects. WEBs are additional benefits that are not captured within the conventional CBA. [69] Both CBA and WEBs capture the direct impacts of the project or policy. The economy wide flow-on or multiplier impacts of the market based costs and benefits can be assessed using the economy wide General Equilibrium macro-economic model (CGE model).

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[62] Productivity Commission (2014) Public Infrastructure, Inquiry Report No. 71, May 2014
[63] Infrastructure Australia (April 2015) Australian Infrastructure Audit
[64] Ibid, p.1
[65] Lowe, P. (2013) '*Productivity and infrastructure*', presented at IARIW-UNSW Conference on Productivity Measurement, Drivers and Trends, Sydney
[66] Ibid
[67] Ibid, p.6
[68] Ibid, p.6, emphasis added
[69] *The NGTSM[69] defines productivity benefits as road user benefits to businesses (i.e. car users making business-related trips and freight users.[69]) resulting from a project or initiative which have a clear and significant productivity impact by reducing the costs of production or improving the productivity of inputs. Applicable road user benefits include travel time savings, vehicle operating cost savings, and reliability improvements for business and freight users as well as WEBs.*

Figure 25: Economic assessment frameworks

Further information on each of the economic assessment frameworks are provided below.

Economic assessment frameworks	
Conventional Cost Benefit Analysis	Cost-benefit analysis provides a robust method for evaluating both the market and non-market costs and benefits of a project or policy change. The analysis is undertaken from a whole of society perspective, regardless of who pays for the project. The estimated net benefits (total benefits minus total costs), along with any significant impacts that cannot be valued, are used to help decision-makers rank and assess options/choices available to them. The objective of the CBA is to identify project or policy options that enhance societal welfare from a utilitarian perspective. For transport projects, conventional CBA typically entails quantification of travel time savings (business and personal); vehicle operating cost savings (business and personal); travel time reliability benefits; environmental externalities and accidents; and is contrasted against the capital and operating/maintenance expenditure.
Wider Economic Benefits	CBA is based on the assumption of perfect competition and no market imperfections. The presence of market imperfections means that certain additional impacts (costs and benefits) are not captured within the conventional CBA. These additional sources of impacts are referred to as Wider Economic Benefits (WEBs). These benefits are most relevant to significant transport and land (re)generation projects and typically refer to changes in productive capacity of the economy. There are four types of WEBs attributable to transport and land (re)generation projects: • WB1: Agglomeration economies; • WB2: Labour market deepening; • WB3: Output change in imperfectly competitive markets; and • WB4: Increased competition. Of the four types of WEBs, WB4 is not deemed relevant for Australian cities. Literature suggests that a transport project, in most developed economies that are characterised by reasonable transport access, is unlikely to have any material impact on industry competition.
Economic Impact Analysis/CGE Modelling	Economic impact analysis using Computable General Equilibrium (CGE) modelling uses real economic data to estimate the 'economy-wide' impacts of a proposed project or a policy change. In line with NGTSM, we use the CGE model to assess the flow-on impacts of economic/productivity enhancing benefits assessed through CBA and WEBs. Non-market, welfare impacts such as personal travel time savings, accidents and externalities for instance, have not been assessed in the CGE model.

Source: KPMG based on Victorian Department of Treasury and Finance (2013) Economic Evaluation for Business Cases Technical Guidelines and National Guidelines for Transport System Management (2014)

Recently, most significant transport projects have been assessed by *separately* utilising each of the above noted frameworks. The value of the three frameworks however comes from a

systematic consideration (which is theoretically and internally consistent) of the individual impacts assessed using the three separate frameworks; and, using it to provide insights on the economic outcomes in terms of GDP/GSP. The use of frameworks and tools in this manner to assess the economic contribution of transport projects can significantly enhance the value of the analysis to the decision makers.

C.3.2 Assessing total economic contribution

The National Guidelines for Transport System Management (NGTSM) supports robust transport decision-making and serves as a national standard for planning, developing and maintaining transport systems. The NGTSM is currently being revised and will bring the guidelines up to date to ensure ongoing best practice. The revision to the guidelines is being overseen by a Steering Committee comprising representatives from Australian transport bodies, including Commonwealth, State and Territory governments.

As part of the revision, the NGTSM has published the paper on productivity metrics.[70] The productivity metrics are quantitative measures that provide an understanding of the extent to which an initiative contributes to state and territory, as well as national, productivity. The NGTSM demonstrates how the above noted economic evaluation frameworks can be utilised to provide a comprehensive understanding of the productivity and economic contribution of transport projects.

The NGTSM paper identified a number of cost/ benefit items that can be incorporated within the productivity metrics. This is summarised in the table below.

Table 18: Benefits included in productivity metrics

Benefits included in productivity metrics	**Benefits that should *not* be included in productivity metrics**	**Benefits that should ***not currently*** be included in productivity metrics***

• **For business travellers and freight:**
  ○ **Travel time savings**
  ○ **Vehicle operating cost savings**
  ○ **Reliability improvements**
• **Wider economic benefits**
  ○ **WEB1 – Agglomeration economies**
  ○ **WEB2 – Labour market impacts**
  ○ **WEB3 – Output change in imperfectly competitive markets**
	Non-business (i.e. private) travel benefits, including for journey to work:
	• Travel time savings
	• Vehicle operating cost savings
	• Reliability improvements (if available)
		The productivity elements of:
		• Safety benefits
		• Environmental health benefits
		• Health benefits from active travel
		
		** The NGTSM recommended approach and parameters for quantifying the above benefit items currently include productivity as well as welfare components. Only the productivity component of the above benefit items can be included in productivity metrics. As such NGTSM recommends that these benefits should not be included in productivity metrics until such time as the recommended parameters are updated to separately reflect the productivity and welfare components.*

Source: Transport and Infrastructure Council, 2014

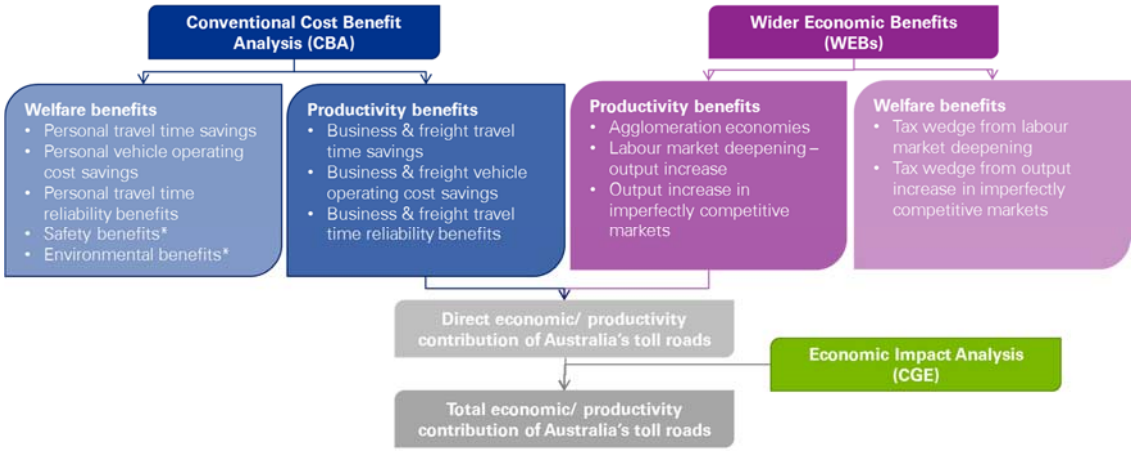
[70] Transport and Infrastructure Council (Dec 2014) 2014 National Guidelines for Transport System Management in Australia – Productivity Metrics

Given the policy focus on productivity as well as the focus of the revised NGTSM, this report applies the NGTSM proposed approach to estimate the benefits of infrastructure investment. The approach is also consistent with that adopted by Infrastructure Australia to estimate the DEC in its recent audit of Australian Infrastructure.[71] [72]

The NGTSM productivity metrics approach requires estimation of CBA and WEBs to assess the direct economic impacts. As per the NGTSM, the CGE model is then applied to estimate the flow-on effects to understand the total impacts of the project or policy proposals.

Our approach to estimating the Total Economic Contribution (TEC) of Australia's toll roads is summarised in the figure below. The analysis we have undertaken assumes that without the tolls many of our critical motorways/roads will not have been delivered (high scenario) or would have been delayed by at least 5 (low scenario) to 10 years (central scenario).

Figure 26: Estimating total economic contribution of Australia's toll roads



** Safety and environmental benefits incorporate productivity enhancing elements. The valuation parameters as specified in NGTSM for assessing these benefits incorporates both economic and welfare impacts. As such, and consistent with the NGTSM productivity metrics paper, these benefits have not been included in assessing the economic/productivity contribution.*

Our analysis includes the benefits to toll road users only. The incremental congestion from users of tolled roads moving to non-tolled networks has not been quantified. By not including increased congestion in non-tolled networks, the analysis is considered highly conservative.

Further detail on the approach to economic analysis is provided below.

[71] Infrastructure Australia (April 2015) Australian Infrastructure Audit

[72] The IA approach to estimating DEC) of transport projects however focuses on direct economic impacts (as measured by the Gross Value Added measure which equates to GSP at the State level and GDP at the national level). It did not assess the flow-on or multiplier impacts using the CGE model. Consistent with the NGTSM Productivity Metrics paper, the approach includes quantification of direct and flow-on or multiplier effects of the toll roads. This provides us with an understanding of the 'Total Economic Contribution' (TEC) of the toll roads in Australia.

C.4 Economic appraisal parameters

C.4.1 Economic appraisal parameters

Table 19 shows the parameters used for the economic appraisal.

Table 19: Economic appraisal parameters

Parameter description	Value	Remarks and Source
Appraisal period	10 years	Benefits of toll roads have been estimated over the period 2011 to 2020 (inclusive).
Base year for discounting	2011	First year for which traffic modelling outputs are available.
Price base	Q2 2014	Unit rates for project benefits have been indexed to Q2 2014 using either CPI or the change in average weekly earnings.
Discount Rate, Real	7.0%	Default discount rate as per Infrastructure Australia guidance. Assuming inflation of 2.5 per cent (the mid-point of Reserve Bank of Australia's consumer price index target of between 2 and 3 per cent), the 7 per cent real discount rate equates to a nominal discount rate of 9.7 per cent.
Daily to annual expansion factor	345	Traffic model outputs have been provided for different time periods across an average weekday. Benefits were calculated for each of these time periods, and then summed to give a total for an average weekday. To convert these to annual benefits for use in the economic appraisal, an expansion factor of 345 has been applied. The expansion factor is based on the Transport for NSW, 2013 *Principles and Guidelines for the Economic Appraisal of Transport Initiatives* Sydney, NSW.

C.4.2 Economic benefit calculation methodology

Table 20 details the broad approach used to calculate the identified project benefits.

Table 20: Calculation methodology

Benefit Categories	Broad Approach
User benefits	
Travel time	Quantified using transport model outputs (change in vehicle-hours travelled for trips using the tolled and non-tolled networks and applying values of time derived from the NGTSM.
Vehicle operating costs	Quantified using transport model outputs (change in vehicle-kilometres travelled (VKT) and average speed in the network) and applying valuation parameters from NGTSM.
Travel time reliability	Quantified using transport model outputs (change in vehicle-hours travelled and vehicle-kilometres travelled for trips using the tolled and non-tolled networks). The change in the standard deviation of travel time (as a proxy for reliability) is then calculated based on these change in time and distance using valuation parameters from the UK Department for Transport *Analysis Guidance* and the NGTSM.
Non-user benefits	
Greenhouse gas emission savings	Greenhouse gas emissions have been quantified using transport model outputs (change in vehicle-kilometres travelled (VKT) and average speed in the network).

Benefit Categories	Broad Approach
	Fuel consumption has been estimated using parameters from NGTSM and converted to tonnes of CO_2-e using emission factors provided by the Australian Department of Environment.[73]
Wider economic benefits	
WB1 (agglomeration economies)	Quantified using transport model outputs and demographic (population and employment) estimates. The NGTSM (2014) Interim Approach has been applied using agglomeration elasticities estimated by KPMG and decay curves inferred from transport model outputs for generalised travel costs for business trips.
WB2 (labour market impacts)	Quantified using transport model outputs (average generalised cost of commuting) according to the approach outline in the NGTSM.
WB3 (imperfect competition)	Quantified using transport model outputs (business travel time savings) according to the approach outline in the NGTSM.
Macroeconomic impacts	
Computable Generalised Equilibrium modelling	As per the NGTSM, the CGE model is used to estimate the flow-on effects of the productivity benefits. Specifically, the study used the MMRF model to estimate the economy wide impacts of the Tolls Roads in Australia. The MMRF model is a multi-regional, dynamic CGE model. It distinguishes up to eight Australian regions (six States and two Territories) and, depending on the application, up to 144 commodities/industries. The model recognises: • domestic producers classified by industry and domestic region; • investors similarly classified; • up to eight region-specific household sectors; • an aggregate foreign purchaser of the domestic economy's exports; • flows of greenhouse gas emissions and energy usage by fuel and user; and • up to eight State and Territory Governments and the Federal Government. The model contains explicit representations of intra-regional, inter-regional and international trade flows based on regional input-output data developed at the Centre of Policy Studies, Monash University, and includes detailed data on State and Federal Governments' budgets. As each region is modelled as a sub-economy, MMRF is ideally suited to determining the impact of region-specific economic shocks. Second round impacts are captured via the model's input-output linkages and – as outlined above – explicitly account for economy-wide and international resource constraints.

[73] Australian Government (2014) National Greenhouse Accounts Factors

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