South East Queensland Regional Plan 2017 *ShapingSEQ*

Background paper 3: Connect

September 2017

Queensland Government

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Introduction

Purpose

The purpose of this paper is to inform, support and provide background material for the policy and implementation provisions of the South East Queensland Regional Plan 2017, called *ShapingSEQ*, in relation to the connect theme. This theme covers infrastructure matters that have a strong interrelationship with the land use planning decisions and policy of *ShapingSEQ*.

Another four interrelated background papers have been prepared to inform *ShapingSEQ*, covering the themes of:

- Grow – considering the preferred pattern of settlement changes to best manage projected regional growth.
- Prosper – considering the approach to supporting improved economic and employment outcomes for the region.
- Sustain – considering issues for the protection and management of our natural environment and sustainable social outcomes for our communities.
- Live – looking at ways to improve the quality of design and amenity in our urban areas.

Figure 1: South East Queensland region

Combined, the papers provide the foundation upon which *ShapingSEQ* has been prepared.

Theme defined

This background paper is primarily about the relationship between infrastructure, particularly transport, and land use, how it affects land use pattern, and how it affects the cost and efficiency of the movement of people to access work and services, and social interactions. Key related considerations include:

- the interrelationship with economically important freight movement
- a mode shift to passenger transport supported by a network of frequent and reliable public transport services along key corridors
- active transport as a preferred mode of transport for journeys to work, connecting to public transport and local trips
- digital communications to support the economy and as an alternative to travel
- other infrastructure required to support urban land uses, such as water and sewerage
- the provision of adequate and appropriate social infrastructure for the communities.

Relationship with other themes

The connect theme has a very strong interrelationship with the grow theme, which is primarily about settlement pattern issues. However, this background paper focuses on the transport and other infrastructure matters related to the land use choices, and particularly the future residential settlement pattern, considered by the grow theme.

There is also a strong relationship to the employment location and accessibility issues considered by the prosper theme.

Connected public transport increases the opportunity for productivity by moving people; and their skills and knowledge, within and between economic markets. In more densely populated

environments where private vehicle usage is constrained by the impacts of congestion, public transport infrastructure and services can facilitate increased employment opportunities that are attractive to both employers and workers. Providing a frequent and reliable public transport network is a crucial component of achieving this vision as it provides the ability to connect population and employment nodes and offers the opportunity for geographically dispersed populations to contribute productively to the economy.

The freight network also plays a key role in linking key productive areas and regional economic corridors and the role of the rail and road freight network in South East Queensland (SEQ) is reflected in both the prosper and connect themes.

Transport and other infrastructure are also fundamental in achieving sustainable social outcomes, including affordable living, and contribute to the liveability of the region for SEQ's communities, as addressed by the sustain and live themes. A key theme of the sustain theme is offering a range of affordable living option across the whole region so people can find the right housing in the right places with access to employment and outstanding places and services. This can only be achieved through the provision of a frequent and reliable public transport network and access to other infrastructure such as water and sewer.

Context

Related specific issues research

To inform this paper, associated research has been undertaken into several specific issues related to the connect theme, including the following:

- The appropriate approach to reflecting infrastructure needs and challenges in *ShapingSEQ* to support effective delivery of infrastructure in connection with related land use change.
- Consideration of how despite considerable investment in public transport and a desire by previous regional plans to reduce car dependency in SEQ to achieve more sustainable communities with genuine travel choices there has been an overall decline in per capita public transport patronage and mode share, and active transport mode share.
- Identification of spare capacity in the high-frequency public transport network, and how this might guide the preferred future distribution of growth in the region.
- Identification of the strategic transport system to 2041, including major existing and potential services required to motivate and support the preferred settlement pattern of *ShapingSEQ*.
- Consideration of autonomous vehicles, including their potential take-up in the future and how this and other technological changes may affect transport and land use planning, including any implications that can be drawn on for *ShapingSEQ*.

The research findings into specific issues have been integrated into the approach, analysis, discussion and conclusions of this background paper as appropriate.

Other government strategies

Other government strategies that relate to the connect theme, and that have been considered by *ShapingSEQ*, include the following:

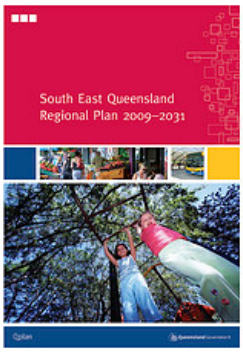
- The Queensland Plan:
  - Building safe, caring and connected communities, including providing an integrated and reliable transport network, is one of the Queensland Government's key objectives.
  - The Queensland Plan goal is for infrastructure to provide connectivity and accessibility across the state.
- State Infrastructure Plan:
  - Outlines the government's strategic direction for planning, investment and delivery of infrastructure in Queensland.
  - Release in two parts – Part A the strategy that is revised every five years and Part B the program revised annually.
  - Provides a funding pathway for region-shaping infrastructure identified in *ShapingSEQ*.
- SEQ Regional Transport Plans:
  - Previous integrated regional transport plans (IRTP's) – including Connecting SEQ 2031 (2011), Transport 2007, and the SEQ Integrated Regional Transport Plan (1997) – were prepared partly in response to the 2009 regional plan and previous SEQ regional plans
  - New plans are being developed for Metropolitan, North Coast, South Coast and Darling Downs, which will guide transport decisions across all tiers of government and will align with *ShapingSEQ*.
- South East Queensland's Rail Horizon:
  - This identifies the rail network enhancements in progress and planned, and the corridors being protected for future line extensions.
- Queensland Transport Policy:
  - This policy is being developed and will address megatrends and emerging challenges and opportunities for transport in Queensland, including transformational technologies. A suite of four discussion papers have been prepared focused on Challenges and Opportunities, Transforming Mobility, Smarter Infrastructure – Sustainable Funding and Improving

Liveability and Prosperity. These discussion papers consider transport disadvantage, autonomous vehicles and mobility-as-a-service as key themes.

- Future Directions – SEQ passenger transport:
  - This paper is being developed and is expected to propose a number of principles and a range of strategies to address passenger transport challenges and opportunities in SEQ.
- Connecting Brisbane:
  - Provides a shared vision for the future of public transport in the Brisbane local government area to create a customer-friendly, efficient, integrated and reliable system that promotes connectivity and provides a foundation for future growth.
  - Outlines a more detailed public transport network for Brisbane based on the regional network identified in *ShapingSEQ*.

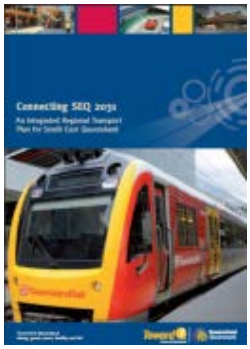
Current and previous regional plans

Since the first SEQ Regional Framework for Growth Management in 1995 (RFGM 1995), previous regional plans have emphasised the need for better integration of transport and land use planning. Integrated planning recognises the complementary roles that transport and land use play in a sustainable, liveable and productive urban environment.



Previous regional plans, and their associated Integrated Regional Transport Plans (IRTPs), have sought to maximise the efficient use of public transport and encourage active transport (walking and cycling), reducing dependence on private vehicles. The RFGM 1995 proposed a goal of increasing public transport use by 50 per cent as a share of total trips and enunciated the following principle:

- The focus of transport planning should shift from responding to demand on a local or sub-regional basis to influencing demand by supporting the achievement of the urban growth, residential development, employment location and major centre objectives.[1]



Connecting SEQ 2031, the most recent IRTP, has the ambitious goals of doubling both public transport usage from 7 per cent of total trips in 2006 to 14 per cent in 2031 and active transport from 10 per cent of trips in 2006 to 20 per cent in 2031.[2]

To support better integration with transport planning and increased use of public transport, previous regional plans have sought to increase densities and activity in centres and other locations with good access to existing and planned public transport, e.g. transit-oriented development precincts.

Local planning, consistent with previous regional plans, is supporting the emergence of higher residential densities around regional centres and close to public transport stations and services as patterns of residential demand change over time. Support for the emergence of higher residential densities around regional centres, close to public transport stations and services is a principle that has been carried forward in *ShapingSEQ*.

ShapingSEQ provides guidance regarding a range of infrastructure networks in addition to transport including greenspace, energy, information and communication, waste, social

[1] Department of Housing, Local Government and Planning (1995), *South East Queensland Regional Framework for Growth Management 1995*, Regional Coordination Committee, SEQ 2001, November 1995
[2] Department of Transport and Main Roads (2011), *Connecting SEQ 2031—An Integrated Regional Transport Plan for South East Queensland*

infrastructure, and water. It seeks to provide an overarching framework for consideration of infrastructure, in particular strategic transport networks.

The State Planning Policy (SPP) establishes the scope for state land use planning and development interests in transport and infrastructure. The SPP directly includes policy related to planning for the efficient use, extension, and protection of state transport infrastructure, strategic airports and aviation facilities, strategic ports, and energy and water supply infrastructure. It also supports efficient use of existing, and cost-effective provision of new, education, health, recreation and other social infrastructure through the policy for liveable communities.

ShapingSEQ is focused on providing a spatial interpretation of the SPP for SEQ and establishing a strategic transport network that will be required to support the 50-year vision of the plan.

Related infrastructure planning and plans

The RFGM 1995 identified major public transport and road links for investigation and proposed other infrastructure plans and strategies. The RFGM 1998 took a similar approach, although the 1997 IRTP also supported specific busway proposals. The framework developed in 2000 generally only updated priority actions of the RFGM 1998.[3]

Both the 2005 and the 2009 regional plans were supported by the SEQ Infrastructure Plan and Program (SEQIPP). The SEQIPP was prepared annually from 2005 to 2010 and replaced in 2011 by the Queensland Infrastructure Plan (QIP). Although only providing a degree of funding commitment to projects in the short-term, mainly the four-year budget forward estimates period, the SEQIPP and QIP included detailed lists of infrastructure projects out to the 2026 and 2031 planning horizons of the respective regional plans.

However, there was '…a broad perception that the certainty of forward infrastructure provision … declined with each iteration of SEQIPP…'.[4] The capacity to fund infrastructure has also been adversely affected by government finances in recent years, following a period of relatively high infrastructure expenditure and then reduced revenue. SEQIPP and QIP were seen by many as 'wish lists' of unfunded infrastructure.

The future growth task

The population of SEQ, estimated at about 3.4 million in 2015, is projected to grow to about 5.3 million in 2041 and potentially up to about 7.2 million in 2061.[5] Employment is projected to grow by about one million jobs over 30 years, to about 2.6 million in 2041.[6]

Previous strategic transport modelling by the Department of Transport and Main Roads (DTMR), based on 2011 projections, indicated that the increase in the number of people travelling to and through the Brisbane Central Business District (CBD) between 2012 and 2021 was equivalent to 16 extra inbound lanes of traffic per hour during the morning peak, or about 29,000 more trips. Further, the Bureau of Transport and Regional Economics believes congestion costs in Brisbane are the second fastest growing among Australia's capital cities, after Perth, and will reach an

[3] Abbott, John (2012), *Collaborative Governance and Metropolitan Planning in South East Queensland—1990 to 2010: From a Voluntary to a Statutory Model*

[4] Abbott, John (2012), *Collaborative Governance and Metropolitan Planning in South East Queensland—1990 to 2010: From a Voluntary to a Statutory Model*

[5] Queensland Government (2016), *Projected population and dwellings*, by local government area, South East Queensland, 2011 to 2041, 2015 edition projections (population projection for SEQ as a whole also prepared to 2061 for purpose of SEQ regional plan review)

[6] Queensland Government (2016), *Regional Employment Projections Data Tables—2010–11 to 2040–41*

estimated cost of $6 billion by 2030.[7]

Within the context of the projected growth, perhaps the most significant demographic trend is the changing proportion of the SEQ population aged 65 or over. This is expected to increase from 12.8 per cent in 2011 to about 20.3 per cent in 2041, with implications for travel patterns, including a reduced propensity to travel, particularly in peak hour.[8]

An early stage of work to inform *ShapingSEQ* considered the comparative cost of servicing potential urban growth areas with state transport, water supply and sewerage, schools and electricity infrastructure. This work is available to inform the choice of any new growth areas required to accommodate projected growth, subject to the limitations of the analysis, including the scope of the infrastructure captured (DSDIP 2014).[9]

Linking land use and infrastructure

The settlement pattern of the current and previous regional plans has provided broad guidance for decisions on regionally-significant infrastructure over time, e.g. investments in the rail line to Springfield and upgrading and extending the Ipswich Motorway and Centenary Highway, which support growth in the western corridor.

However, the 2009 regional plan dwelling targets themselves have not generally been used as a basis for infrastructure planning. This is because separate infrastructure planning guidance, currently via the Statutory Guideline 03/14 Local Government Infrastructure Plans, has influenced infrastructure planning to be guided by the current edition projections at the local government level.

In some cases, this has resulted in local governments doing their infrastructure planning for a significantly higher or lower level of development to 2031 than the targets. So infrastructure planning has not been coordinated towards achieving the settlement pattern goals of the regional plan. *ShapingSEQ* seeks to address this by providing a consistent region-wide set of planning assumptions that will be managed through the SEQ Growth Monitoring Program.

Transport in SEQ

The connect theme particularly focuses on transport in a clear commitment to improved integration of land use and transport planning. While a range of infrastructure is required to service urban development transport has the capacity to shape the settlement pattern of SEQ more than other infrastructure, particularly at the strategic level.

The connectedness of SEQ, and the manner and ease of travel, plays a critical role in shaping and supporting our economy and lifestyle. Our transport network – comprising roads, heavy and light rail, busways, ferries, air and sea ports, cycleways, and walking paths – needs to provide efficient and equitable travel options for individuals and businesses. Effective transport networks can help ensure jobs, goods and services, recreation areas, and family and friends are accessible for everyone.

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[7] Department of Transport and Main Roads (2016), *How Queensland Travels, A decade of household travel surveys in Queensland*, http://www.tmr.qld.gov.au/Community-and-environment/Research-and-education/Queensland-Household-Travel-Survey-summary-reports.aspx (accessed 1 July 2016)

[8] Queensland Government (2016), *Projected population and dwellings*, by local government area, South East Queensland, 2011 to 2041, 2015 edition projections

[9] Department of State Development, Infrastructure and Planning (2014), South East Queensland Regional Plan 2014–2041, *Background Paper—Assessment of potential new growth areas*, September 2014

SEQ is currently serviced by the following four modes of public transport operating on scheduled timetables:

- bus including on road mixed with private and commercial vehicles and mode / grade separated (i.e. Busways and dedicated high occupancy vehicle infrastructure)
- trains
- ferries and
- light rail on the Gold Coast.

Other personalised modes of transport other than a private vehicle provide passenger transport services in SEQ but for the purpose of this paper and the regional scale context, the focus will be on mass public transport services.

To be most effective and efficient, the transport network needs to be supported by appropriate interrelationships with land use. Such interrelationships are supported and encouraged by local government planning schemes as required by the policy of *ShapingSEQ*.

Existing examples within SEQ that illustrate the role of transport infrastructure and its relationship to land use in shaping the urban environment include:

- The predominance of the Brisbane as the Capital City Centre for high density office-based employment being located at the focus of the city's and region's public transport network, i.e. the location which is most accessible to the wider metropolitan area and region.
- The location of the emerging Charlton Wellcamp freight and logistics hub, including the new Brisbane West Wellcamp Airport at the junction of major highways west of Toowoomba and the proposed future inland rail link between Brisbane and Melbourne. This hub will be supported by the Toowoomba Second Range Crossing (under construction), which is expected to reduce heavy vehicle travel times from the western side of Toowoomba to the Port of Brisbane by up to 40 minutes.[10]
- The emerging high density residential uses near the junction of the South East and Eastern Busways, Cleveland rail line and South East Freeway access ramps at Buranda.

Transport investment

The Queensland, Australian and local governments, supported by some private investment, have made substantial investments in the transport system across SEQ over many years. The significant infrastructure projects completed over the past 15 years are outlined in table 1.

Table 1: Significant transport infrastructure projects 2000–2016

Year	Project
2016	• North Brisbane Bikeway (stage 1A)
2015	• Moreton Bay Rail
2015	• Legacy Way • Bicentennial Bikeway Upgrade (stage 4)
2014	• Gold Coast Light Rail Stage 1
2013	• Springfield Rail Line • Port of Brisbane Motorway Stage 2 • Veloway 1 (V1) Cycleway (Stage C)

[10] Queensland Treasury (2016), https://www.treasury.qld.gov.au/projects-infrastructure/projects/toowoomba-second-range-crossing/ (accessed 30 June 2016)

Year	Project
2012	• Airport Link • Northern Busway to Kedron • Ipswich Motorway upgrade (Dinmore to Goodna) • Bruce Highway (Sankeys Rd to Traveston Rd)
2011	• Gateway Bridge duplication • Darra to Richlands rail line • Eastern Busway (Buranda to Coorparoo)
2010	• Go Between Bridge • Clem 7 Tunnel • Ipswich Motorway upgrade (Wacol to Darra)
2009	• Eastern Busway (University of Queensland to Buranda) • Sunshine Motorway upgrade • Bruce Highway (Uhlmann Rd to Bribie Island Rd) • Centenary Highway (extended to Yamanto) • Kurilpa pedestrian and cycle bridge • Mt Lindesay Highway upgrade (to Green Rd)
2008	• Tugun Bypass • Inner Northern Busway
2007	• Bruce Highway (Boundary Rd to Uhlmann Rd)
2006	• Eleanor Schonell (Green) Bridge
2005	• Northern Busway to Herston
2004	• Coronation Drive upgrade
2002	• Inner City Bypass • Port of Brisbane Motorway Stage 1
2001	• South East Busway to Eight Mile Plains • Bruce Highway (Caboolture to Gateway Motorway)
2000	• Pacific Motorway (Brisbane to Gold Coast)

In addition to this constructed infrastructure, there have also been significant improvements to the transport system over this period, including:

- improvements and additions to the bus, rail and CityCat fleet
- the introduction of integrated ticketing through Translink in 2004
- the introduction of high-frequency ‘no timetable needed’ (every 10 to 15 minutes) bus routes known as bus upgrade zones (BUZ) services
- all buses, trains and trams are now air-conditioned and wheel-chair accessible.

In comparison to the goals of the 2009 regional plan and IRTP policy, and in the context of the above projects and system improvements and other influences, the following section considers how the way we travel across SEQ has changed over time.

Evidence and issues

Measures of travel trends

Share of travel by transport mode

Since 1981, the population of SEQ has more than doubled to nearly 3.4 million in 2015. Over the same period, use of cars (as driver or passenger) has somewhat increased to be more than 80 per cent of all journeys, but declined slightly for journeys to work over the 2001–2011 decade (figure 2 and figure 3).

Compared to the 1980s, figure 3 shows an overall decline in the proportion of people travelling to work by public transport, walking, and cycling, as car usage has increased. This has been associated with a period of significant, mostly low density suburban, growth across the region. For example, between 1981 and 2011 the combined population density of SEQ's urban centres and localities as defined by the Australian Bureau of Statistics (ABS) declined from 10 people per hectare to 8.3 per hectare (based on Census population counts).

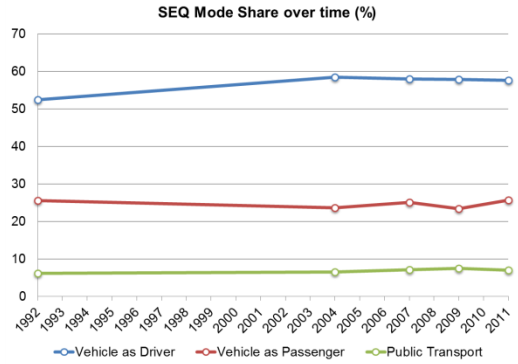

Figure 2: Mode share for all trips

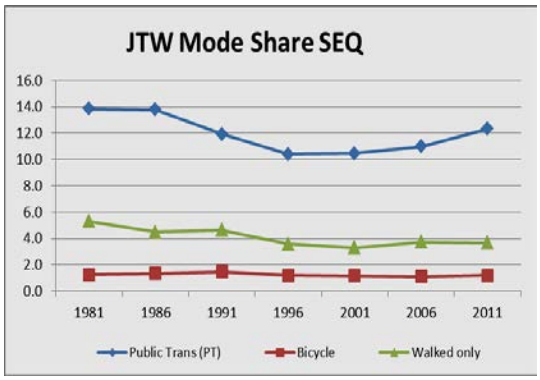

Figure 3: Mode share for journey to work trips

Source: Department of Transport and Main Roads household travel surveys (left) and ABS Census journey to work (right)

Figure 3 also shows that public transport's share of journey to work trips increased from a low of about 10 per cent to about 12 per cent in the decade 2001–2011, consistent with a slight increase in public transport use for all types of trips over the 1992–2009 period. This may be related to the introduction of integrated ticketing and significant new public transport infrastructure during the 2001–2011 decade (although there was also significant new road infrastructure completed in that period).

However, public transport usage data (see figure 4) shows that, while total patronage has remained almost steady since 2009, with continued population growth there has been declining per capita patronage.[11] Figure 2 also shows a slight decline in public transport mode share for all trips from 2009 to 2011 (from 7.9 to 7.4 per cent based on household travel survey data). The Census journey to work data in figure 3 only shows the overall change from 2006 to 2011, so a different trend since 2009 cannot be observed. It is believed recent patronage trends reflect a number of factors, including fare increases, subdued levels of economic activity, slowing population growth,

[11] Fare Taskforce (2016), SEQ Fare Review Taskforce Report, *Review of the fare structure for public transport in South East Queensland*

declining city centre employment, and lower costs of vehicle ownership.[12]

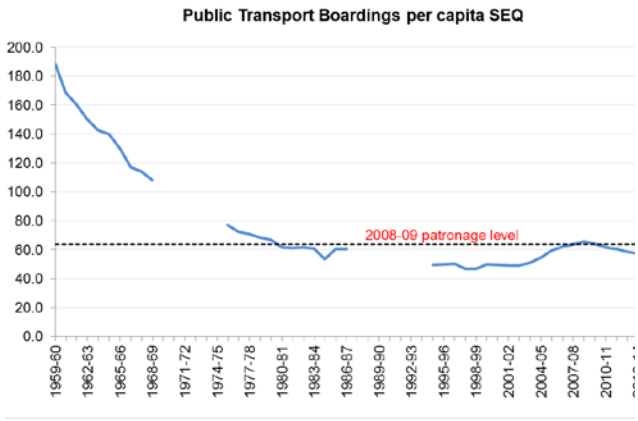

Figure 4: Public transport patronage

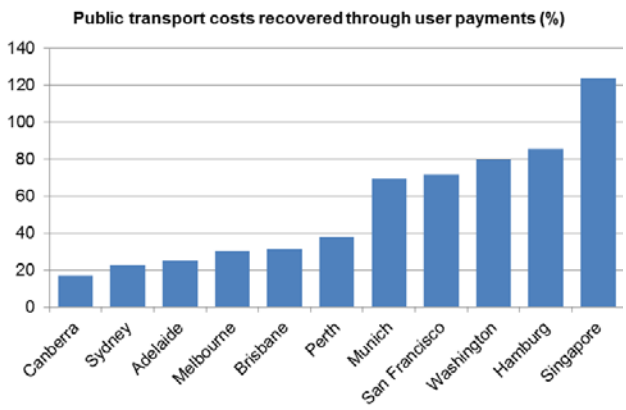

Figure 5: Public transport cost recovery

Source: Compiled by the Department of Transport and Main Roads from Translink and other data (left) and as reported in Trends Infrastructure and Transport to 2030 (Department of Infrastructure and Regional Development 2014) (right)

Compared to some other parts of the world, our dispersed population has required relatively high government subsidies to support public transport services. Figure 5 identifies the percentage of public transport costs recovered through user payments in Brisbane compared to other major Australian capitals and a selection of international cities. For SEQ Translink recovers less than one-third of the cost of service provision from fare revenues.[8]

It is significant that the European/Asian cities in figure 5 have population densities in the order of four to eight times that of Brisbane.[13] Such densities would appear to better support public transport services with higher patronage to recover more of the costs, although other social, economic and environmental factors may also affect usage. Regional densities, in the range of 40 to 80 residents per hectare, have been recommended as appropriate for achieving transport and other benefits for semi-constrained urban areas.[14] The overall density of the Brisbane urban centre, as defined by the ABS, was only about 11 persons per hectare in 2015, compared to about 22 for Sydney and 16 for Melbourne.

There has been an overall decline in public transport mode share since the 1980s, and a decline in per capita patronage since 2009. This is despite the fact that, in 2015, 74 per cent of SEQ's population was located within 400 metres of a public transport stop.[15] Of more significance for public transport use is the fact that only 22 per cent of SEQ's population are within 400 metres of a high-frequency stop or public transport station. Alternatively approximately 31 per cent of people live within 800 metres of high-frequency stop or public transport station.[16]

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[12] Fare Taskforce (2016), *SEQ Fare Review Taskforce Report, Review of the fare structure for public transport in South East Queensland*

[13] *Atlas Environnement du Monde Diplomatique* (2007) and Newman and Kenworthy (1989), as reported at https://globalizationstudies.sas.upenn.edu/node/737 (accessed 11 July 2016)

[14] Litman, Todd (2016*), Determining Optimal Urban Expansion, Population and vehicle Density, and Housing Types for rapidly Growing Cities*, World Conference on Transport Research, Shanghai, 10-15 July 2016 (Draft paper prepared 30 October 2015)

[15] Department of Transport and Main Roads (2015), *Queensland Transport System Snapshot*, Transport Infrastructure Portfolio, Benefits Performance Evaluation, July 2015, Version 2.0 (Interim Release)

[16] Department of Transport and Main Roads (2016), *Analysis of ABS estimated resident population data relative to high frequency transport stops/stations*

Of course, SEQ is a diverse region with a broad range of local settlement patterns and travel behaviours. For example, three in four people travelling to the Brisbane CBD in the morning for work use public transport, but across SEQ this figure declines to one in five, with three in four getting to work by private vehicle (as a driver or passenger).[17] In comparison to the Brisbane CBD, principal activity centres are predominantly accessed by private vehicles, e.g. the following percentages of people access the centres for work by public transport, walking or cycling:

- Greater Brisbane 11 per cent
- Gold Coast 10 per cent
- Sunshine Coast 9 per cent.[18]

Distances travelled, trip duration and travel speeds

In 2009, on average, SEQ residents travelled 31 kilometres per day, taking 65 minutes to do so. Across SEQ, average trip duration (all purposes and modes) increased from 18 to 20 minutes between 1992 and 2009, while at the same time the average trip length increased from about eight to 11 kilometres (see figure 6).

Journeys to work are the longest of all trip purposes, averaging 15.7 kilometres and 30 minutes (20 kilometres and 50 minutes for those travelling to the Brisbane CBD), compared to the average shopping trip of 7.5 kilometres and 16 minutes and average education trip of 7.5 kilometres and 23 minutes. On average, trips using public transport are 15.4 kilometres and 49 minutes, compared to 10.7 kilometres and 19 minutes for trips by private vehicle (as driver).[19] The greater length and time of work trips reflects the increased overall usage of the transport network during peak morning and afternoon travel times.

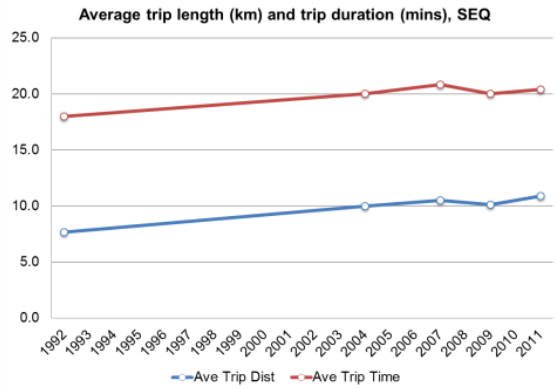


Figure 6: Average trip length and duration
Source: Household travel and Travel time surveys

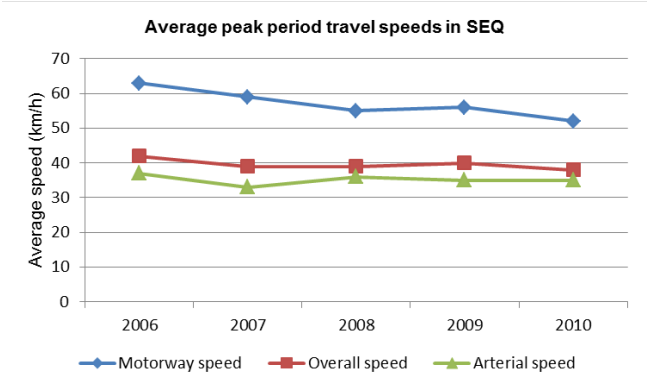


Figure 7: Average peak period travel speeds

Data from 2006 to 2010 points to a decline in average travel speeds over time on SEQ's major roads (see figure 7), indicating the challenges associated with servicing increased and changing travel patterns across the transport network.[20] However, DTMR's reported 'Road network efficiency – Average travel time per 10 kilometres' has not changed significantly during the period 2010–11 to 2015–16. It has remained at about 11 minutes in the morning peak period and 11.5 minutes in the

[17] Department of Transport and Main Roads (2012), *Travel in south-east Queensland—An analysis of travel data from 1992 to 2009*
[18] Department of Transport and Main Roads (2016), *How Queensland Travels, A decade of household travel surveys in Queensland*, http://www.tmr.qld.gov.au/Community-and-environment/Research-and-education/Queensland-Household-Travel-Survey-summary-reports.aspx (accessed 1 July 2016)
[19] Department of Transport and Main Roads (2012), *Travel in south-east Queensland—An analysis of travel data from 1992 to 2009* and Department of Transport and Main Roads (2016), South East Queensland Regional Plan*, Key Additional Data and Insights (Draft)*, March 2016 (unpublished)
[20] Department of Transport and Main Roads (2011), *Connecting SEQ 2031—An Integrated Regional Transport Plan for South East Queensland*

afternoon peak.[21]

Travel growth has traditionally grown faster than population growth. Since 1992, the total number of vehicle kilometres travelled (see figure 8) increased 85 per cent compared to population growth of 59 per cent. However, despite the increase in average trip length over the last 20 years, the vehicle kilometres travelled per capita per year are estimated to be somewhat lower in 2015 than in 1991, after reaching a peak in about 2004 (see figure 9). This may be related to the decline in the average daily trips per person from 3.6 in 1992, 2004 and 2007, to 3.3 from 2009 onwards, which has potentially reduced the total kilometres travelled per person.[22]

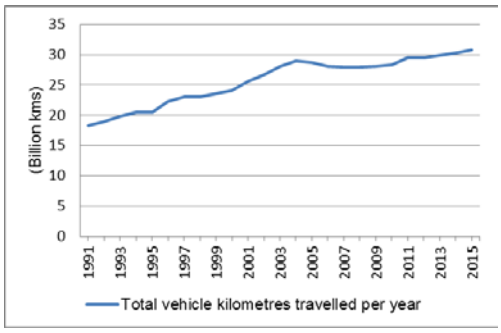


Figure 8: Vehicle kilometres travelled per year

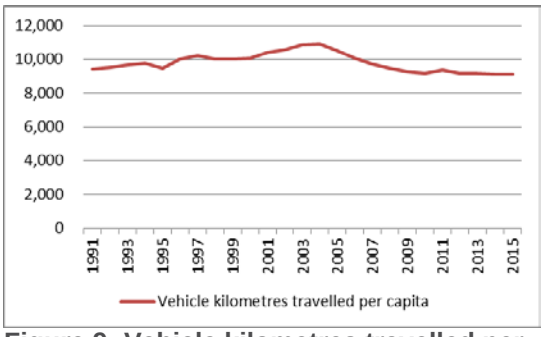


Figure 9: Vehicle kilometres travelled per capita

Source: Queensland Transport Facts 2015 and ABS estimated resident population

Figure 10 and figure 11 illustrate modelled accessibility to the region's key centres in terms of travel time by public transport and car, respectively. There is currently a distinct time advantage for private vehicle travel in many parts of the region, but close to the centres public transport travel times are similar.

[21] Queensland Government (2011 and 2016), *2011–12 Queensland State Budget—Service Delivery Statements*— Department of Transport and Main Roads and *2016–17 Queensland State Budget—Service Delivery Statements*— Department of Transport and Main Roads

[22] Department of Transport and Main Roads (2012), *Travel in south-east Queensland—An analysis of travel data from 1992 to 2009*

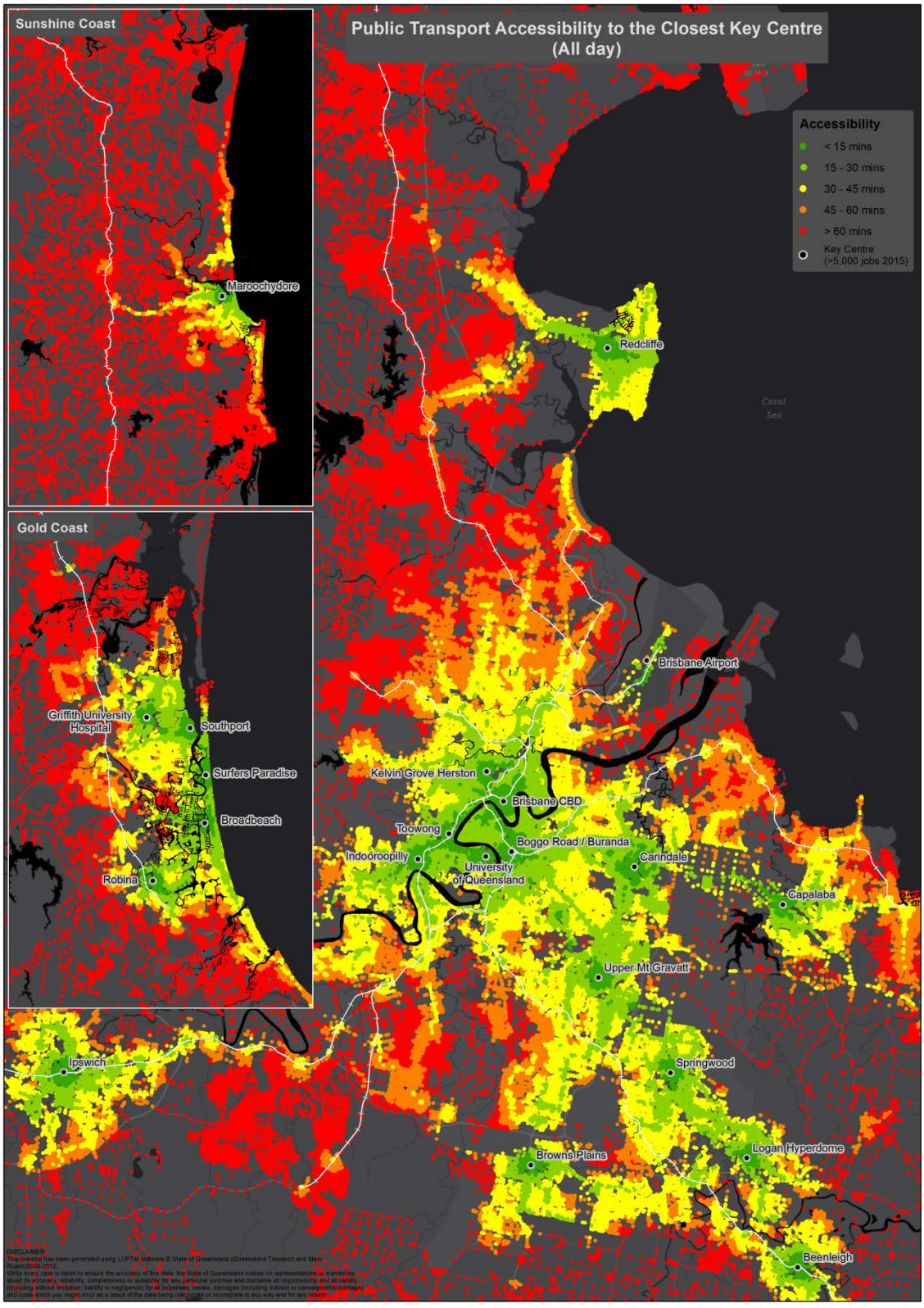


Figure 10: Accessibility to key centres by public transport (2015)

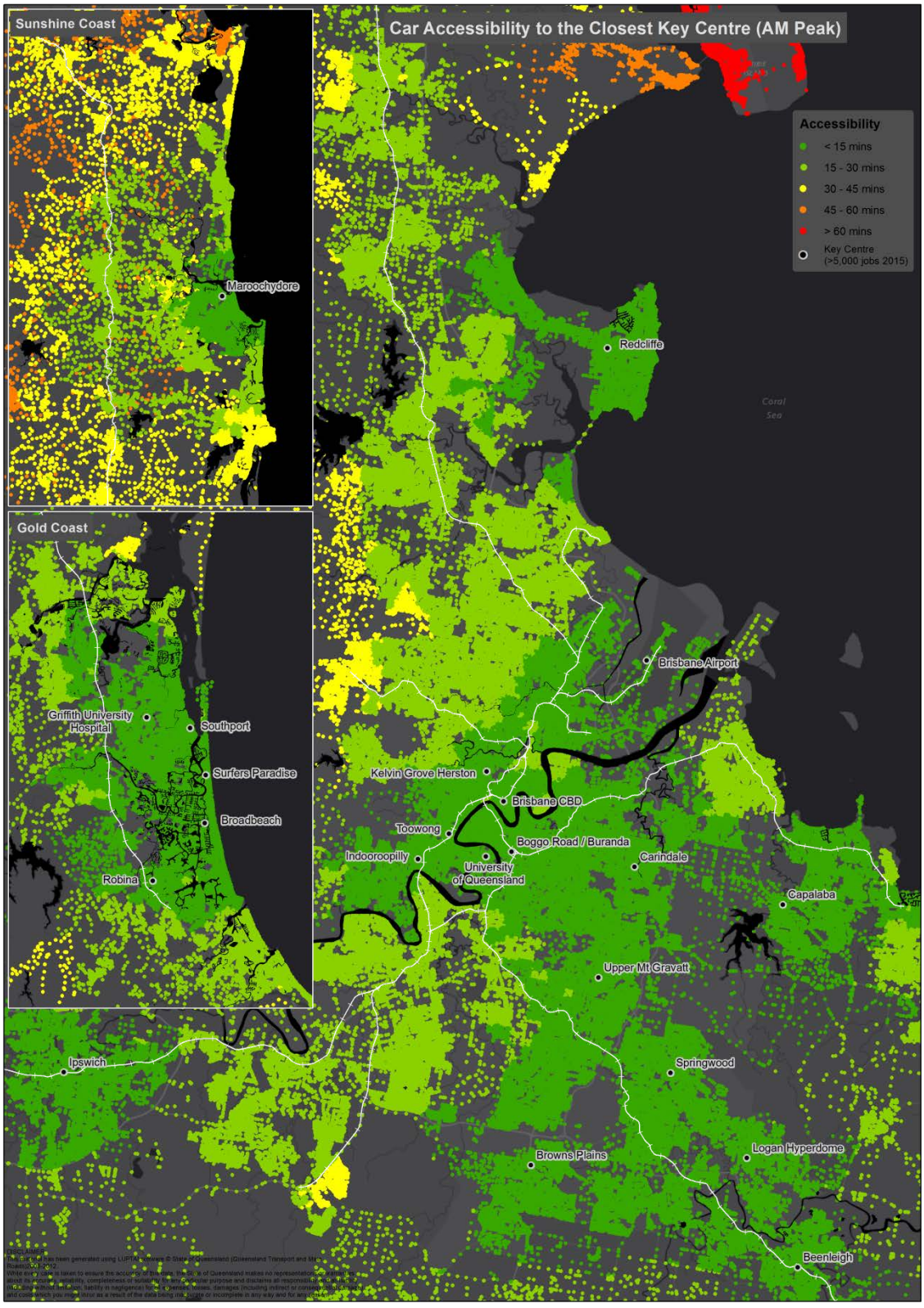


Figure 11: Accessibility to key centres by car (2015)

Source: DTMR's Land Use and Public Transport Accessibility Index

Moving people by public transport

Train, bus, ferry and light rail public transport modes serve specific purposes and functions in providing SEQ with an integrated passenger transport network. This network is supported by a number of elements all of which have received investment in the last 15 years including integrated ticketing and a smart card (go card) fare collection system, modern, air-conditioned and accessible fleet, real time passenger information, dedicated public transport infrastructure such as busway and green bridge construction (figure 12).

Figure 12: Passenger Transport Achievements in the last 15 years[23] (draft SEQPTS 2016)

[23] Draft SEQ Passenger Transport Strategy, 2016, TMR

Barriers to increased public transport use

Delivering a contemporary, user friendly passenger transport solutions that provide value for money for customers and a greater return on government investment relies on having an attractive public transport system[24].

TransLink publishes monthly customer satisfaction data across a range of categories for bus, rail and ferry modes of public transport. Of most importance to this technical note, is the category of reliability and frequency. This metric has been charted for the months of March 2016 to October 2016 including a comparison against the overall service in figure 13.

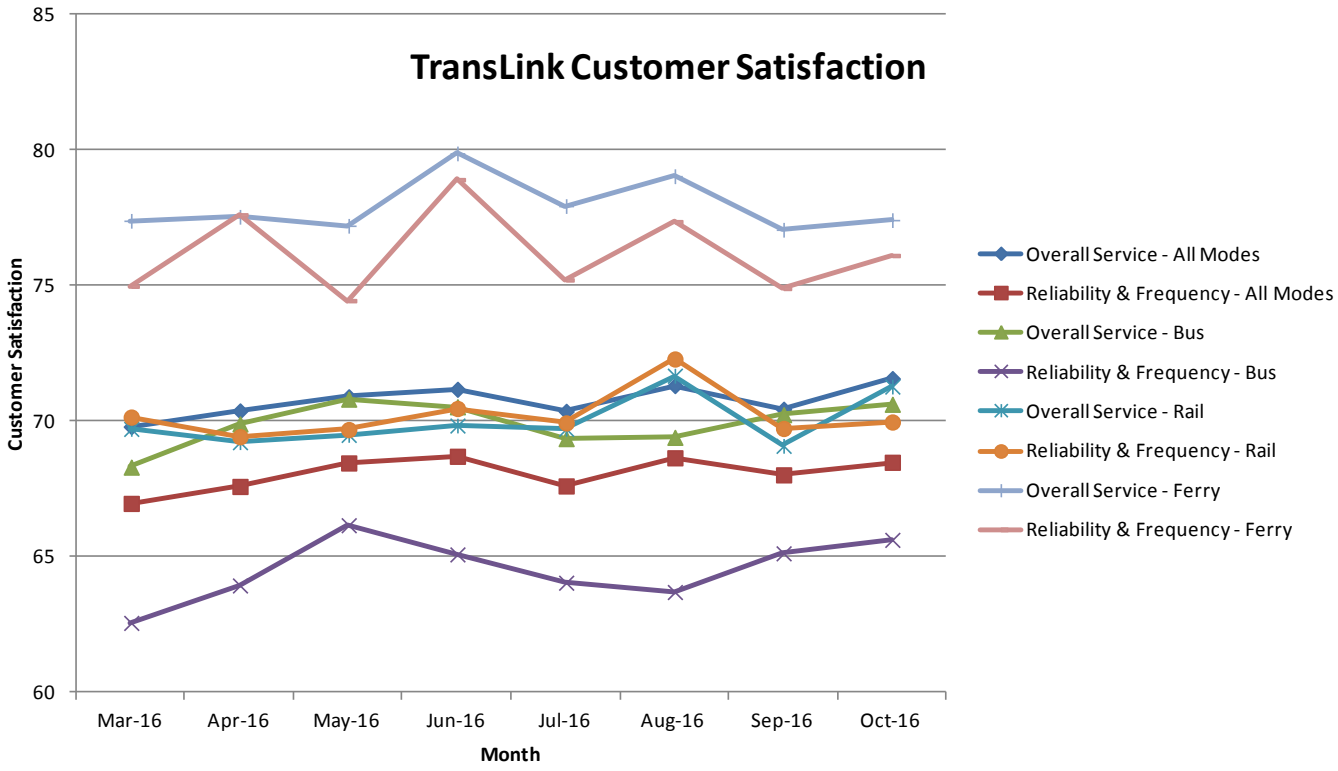


Figure 13: TransLink Customer Satisfaction

As shown, customers consistently rank reliability and frequency lower than overall service for all modes of public transport, most notably bus transport. In fact, the only metric that was ranked lower was affordability, a metric that has been addressed though the roll out of the Fairer Fares initiative.

Focusing further on user perceptions of bus travel is the transport user analysis undertaken by DTMR to identify user perceptions of bus travel and barriers to bus travel. Figure 14 highlights the majority of users view bus travel as unreliable.

[24] Future Directions, SEQ Passenger Transport, February 2016, Department of Transport and Main Roads

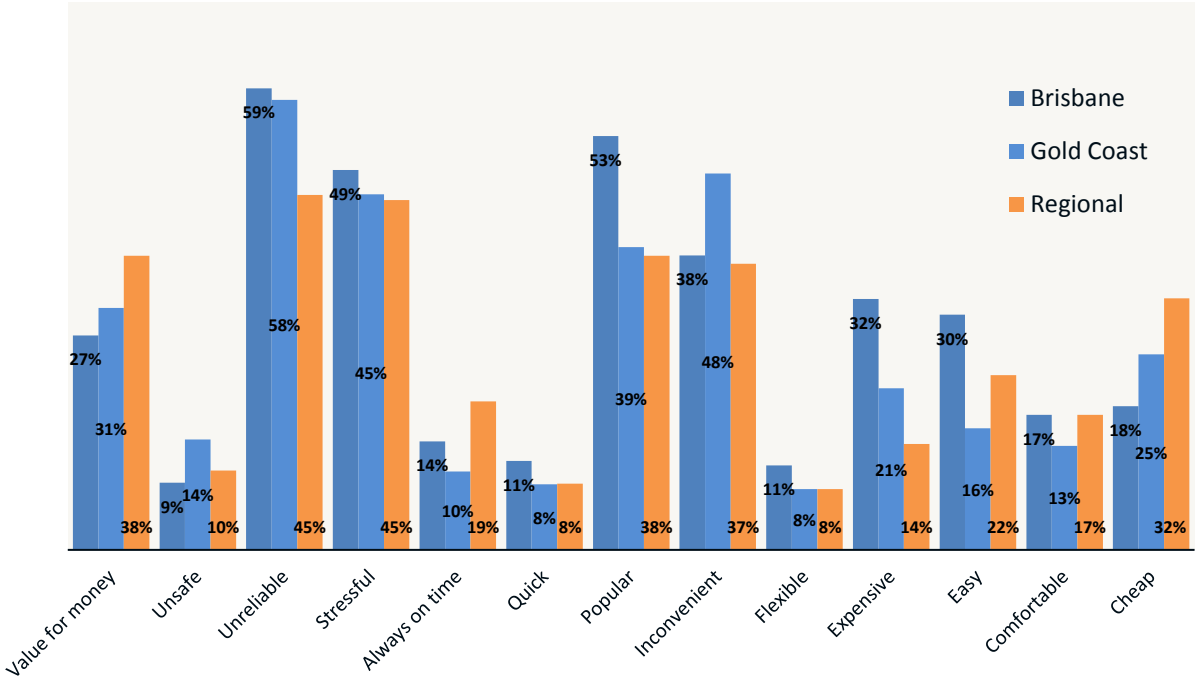


Figure 14: User Perceptions of Bus Travel

As shown, unreliability and inconvenience were among the most cited user perceptions of bus travel. Conversely, buses always being on time were cited by a comparatively low number of users.

The same analysis identified a number of barriers to bus travel. These barriers have been broken into three main categories:

- Operational barriers
- Planning barriers
- Cognitive / person barriers.

These barriers as well as the percent of users that indicated each barrier are shown in figure 15.

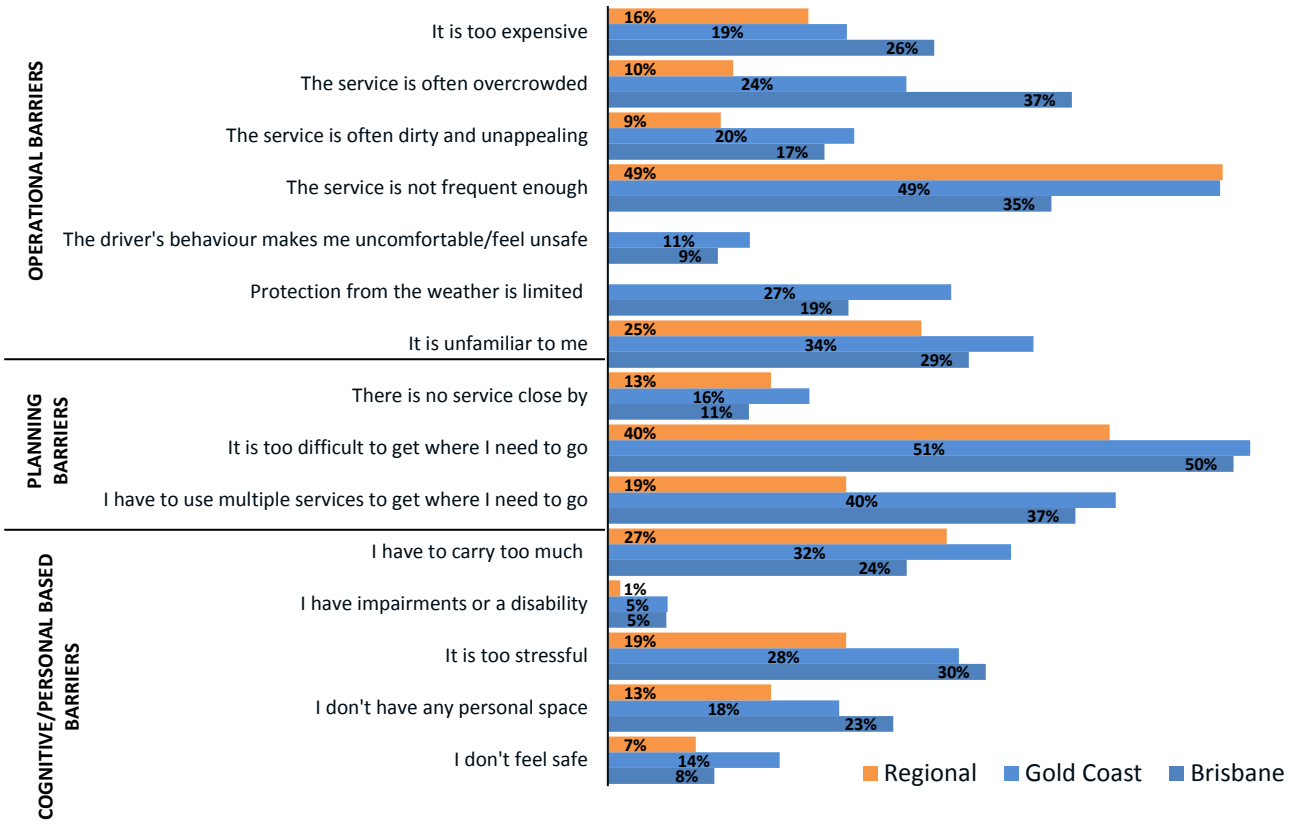


Figure 15: Barriers to bus travel

Again the primary barrier to bus travel has been identified as the service not being frequent enough. The final aspect of the analysis for bus travel looked at the change motivators and what factors would encourage you to use the bus more. These are given in figure 16.

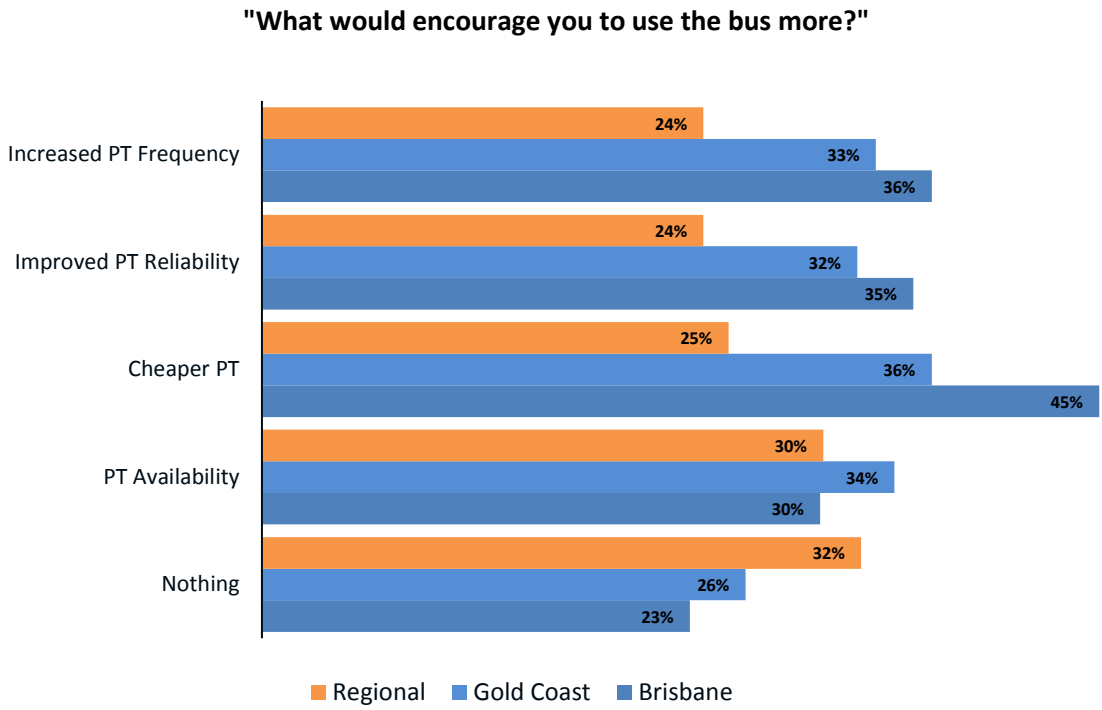
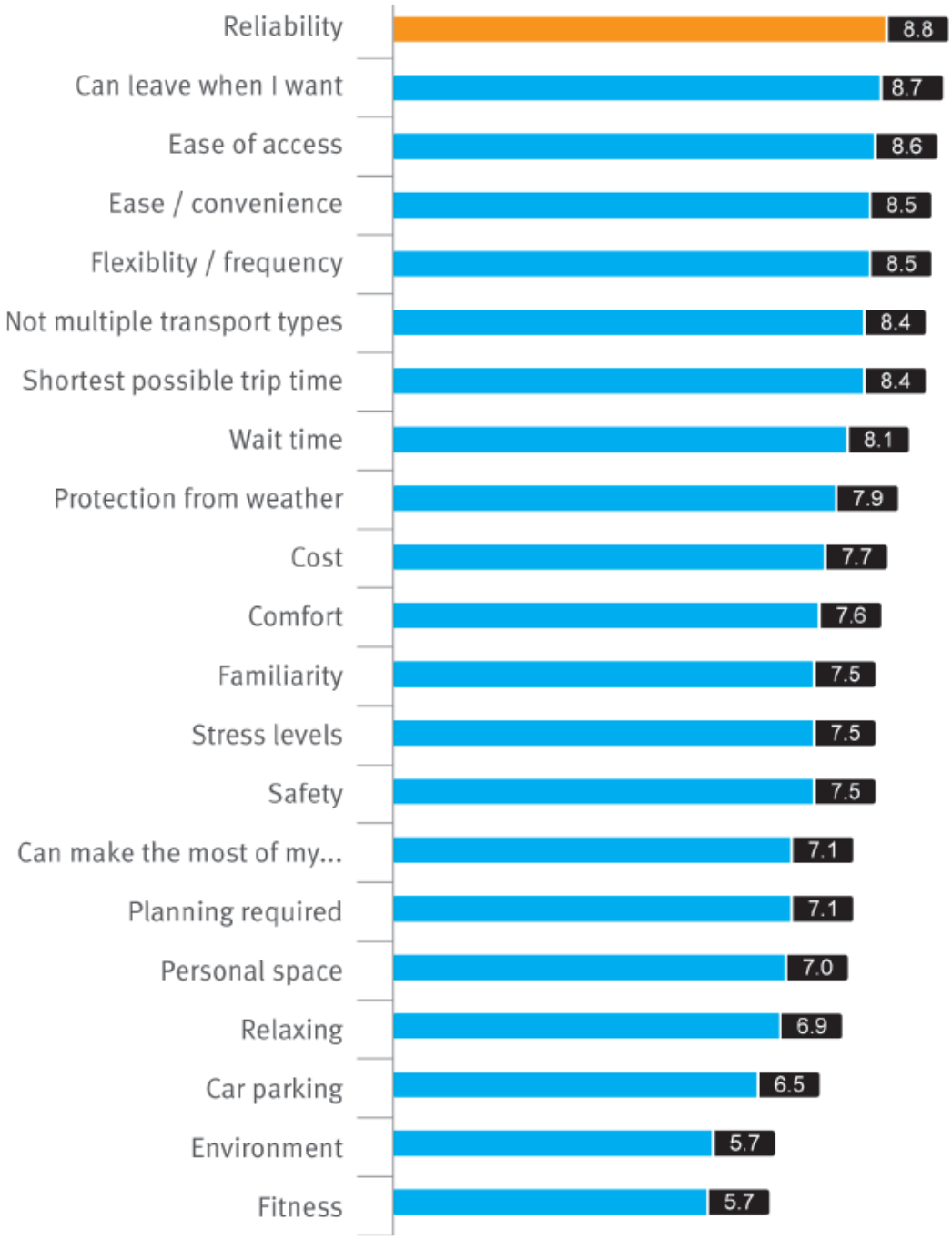


Figure 16: Change Motivators for Bus Travel (Source: DTMR)

The trend continues with a large percentage of respondents indicating that they would be encouraged to use the bus more with improved frequency and reliability. Although the top response that would encourage customers to use the bus more was cheaper public transport, this may no longer be the case due to the introduction of the Fairer Fares package in late 2016.

Overall, transport user analysis consistently highlights frequency and reliability as the two highest influencing factors. Fare prices and transport-related cost concerns are strongest in Brisbane, with more operational consideration driving mode choice decisions across regional Queensland and the Gold Coast.

The importance of reliability has been consistent for several years with this factor having ranked among SEQ residents as the most important factor when deciding what type of transport to use Monday to Friday in 2010. This is shown in figure 15.



[4] Department of Transport and Main Roads Transport Users Analysis 2010

Figure 17: Importance out of 10 in choosing transport mode, 2010, TMR

Public Transport Infrastructure

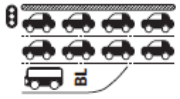
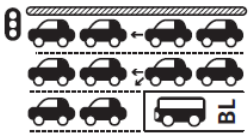
ShapingSEQ is focused on the relationship between frequent, connected and efficient systems and the potential to deliver a rapid, frequent and reliable network to support land use outcomes. Whilst a range of factors contribute to reliable public transport, the best opportunity for reliability and therefore an incentive if it is provided a dedicated right of way such as busway or on road bus / transit lane.

It is generally considered that the more segregation there is between public transport and general purpose traffic, the greater the speed and reliability of the service. Typically, as the investment in priority infrastructure increases so do the benefits such as increased travel speeds and higher

quality stops or stations[25].

There are various forms of bus priority from fully segregated busways to bus lanes or transit lanes or even bus queue jumps or queue reallocation (table 2).

Table 2: Various types of bus priority

Type of bus priority	
Bus lanes 	Bus lanes are exclusively for the use of buses, emergency vehicles in service and bicycles. In some cases, taxis may also be permitted to use bus lanes.
Transit lanes 	Transit lanes are for vehicles carrying two or more people and can be used by buses, private vehicles, taxis, motorbikes and bicycles. They are either T2 (two or more occupants) or T3 (three or more occupants).
Bus queue jumps 	A separate bus only lane at intersections allows buses to move to the 'start of the queue'.
Queue reallocation 	Bus or transit lanes end before each intersection at a distance which allows space for general purpose traffic to re-enter the lane to turn left or to cross the intersection, while allowing buses to cross within a single change cycle.

Signal priority and coordination can also be considered as part of a flexible suite of priority measures:

Signal priority and coordination 	Signal priority moves buses through intersections quicker. It can include: • extended green light time • bus-only traffic light signal (B-phase) • pre-emptive traffic light signals which detect buses approaching and phase green in time to coincide with bus movements • reducing red light time by banning some turns and pedestrian movements, minimising the number of phases in the change cycle.

Importantly, bus priority infrastructure is flexible and can be delivered in a staged approach with lower impact solutions for corridors with lower bus numbers. This is particularly relevant for corridors which have long-term plans for a busway or new rail line. In these cases, a package of bus priority measures can deliver a frequent and reliable network until the busway or rail line is in place, establishing public transport patronage along these key corridors.

[25] SEQPTS Technical Report, 2015, MRCagney

Active transport

Active transport incorporates walking, cycling and other physically active ways of travelling. *ShapingSEQ* focuses on walking and cycling as active transport.

Active transport currently represents about nine per cent of all trips in SEQ, and about five per cent of journeys to work, with cycling about one per cent of all trips and of journeys to work. In 2006, SEQ residents commuted an average of 15.3km to work, which was a 0.1km increase from 2001[26]. The majority of these journeys occurred inside of a local government and seven per cent of these journeys were completed using active transport. This percentage is less than 1 in 20 resident workers cycling or walking to work[27].

Role and function

The broader role of active transport is to promote public health and reduce traffic congestion by encouraging more people to become less reliant on motor vehicles. To support active transport, communities and centres must be well-planned and provide access to employment, education, recreation and community services without extra cost, time or travel.

Encouraging sustainable modes of travel will be essential to facilitate the grow, prosper, connect, sustain and live themes which make up *ShapingSEQ.* To support active transport, communities and centres must be well-planned and provide access to employment, education, recreation and community services without extra cost, time or travel.

Table 3 indicates three different typologies of active transport that have a connection to land use.

Table 3: Typologies of active transport

	i. REGIONAL NETWORK OF DEDICATED INFRASTRUCTURE	ii. ACTIVE TRANSPORT LINKS TO THE PT NETWORK	iii. CBD AND CENTRES / PRECINCT NETWORK
User	Cyclist commuters from suburbs	Pedestrians and cyclists, tourists and commuters	Pedestrians and cyclists, tourists, residents and commuters
Infrastructure	A comprehensive and continuous network of safe and attractive routes and infrastructure for cyclists to commute on	Connecting AT and PT in an efficient and comprehensive way	Cycle and footpath network to link people with necessary and relevant land uses (Park lands, shops and businesses)
Reach	SEQ	At all major PT hubs and stops	The CBD and Principal Centres and Knowledge and Technology precincts

[26] Population growth, jobs growth and commuting flows in South East Queensland, 2013, Department of Infrastructure and Transport

[27] Population growth, jobs growth and commuting flows in South East Queensland, 2013, Department of Infrastructure and Transport

Benefit	To reduce traffic congestion caused by commuters in cars and promote a healthy/active lifestyle	To promote less reliance on private vehicles and the ease of PT modes	To connect people efficiently with different land uses
Deliverables	High level amenities (especially at key activity centres and educational institutions) Safe and high quality infrastructure	Connect residential catchments with PT by good pedestrian and cyclist infrastructure	Provide safe accommodations for all active transport types. A Complete Streets approach to tailor community needs. Make existing resources active resources.

Whilst the three typologies are clearly made up of particular individual characteristics, all typologies recognise that dedicated infrastructure for bikes is appropriate to the commuter cycle network by linking people to their workplaces, CBDs and centres and to public transport.

Well connected networks

Establishing active transport as a favoured and practical option relies on well-connected active transport networks in and around regional activity centres, educational institutions such as schools and universities and public transport stops and stations that are serviced by high frequency services (figure 18). Focusing on active transport connections in these key locations reinforces active transport as a practical mode of travel.

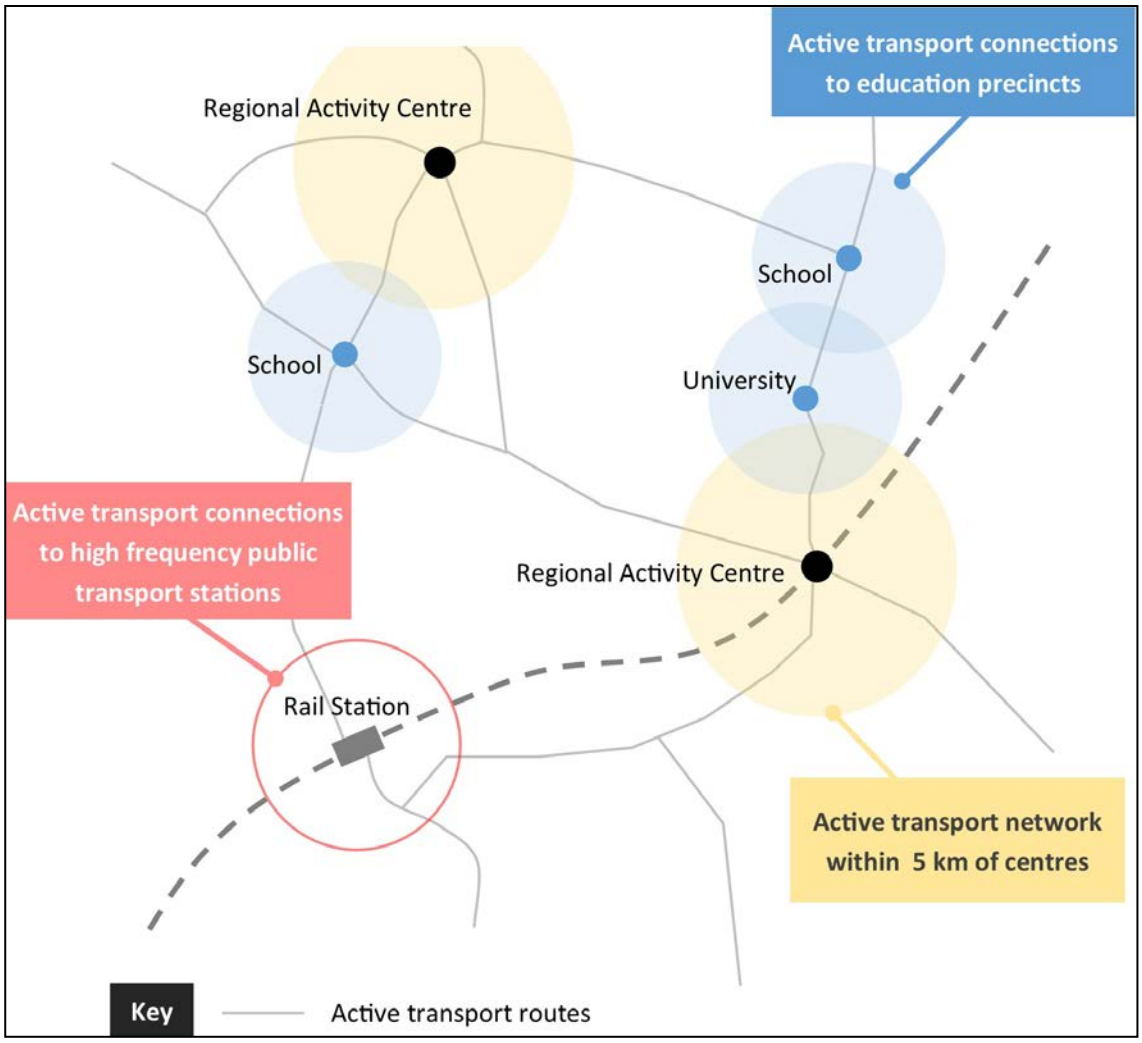


Figure 18: Public transport access to educational institutions to reduce private vehicle use

Cycling, like the other modes in an urban transport network, requires efficient and safe routes and availability of accessible (and like car drivers), safe storage for their 'vehicle'. In terms of the cycling infrastructure on the route, regardless of the level of cycling confidence, those with 'no facilities' or 'bus/cycle lanes' are the least favoured cycle route types.

It is notable that suburbs with better access to major bikeways have higher percentages of commuters cycling to work, and a high proportion of all existing trips are less than 10 kilometres, which is suitable for cycling. Figure 19 shows a link between growth in the proportion of commute trips to the Brisbane CBD by bike and the provision of major cycling infrastructure. This demonstrates the important role that dedicated cycling infrastructure plays in encouraging more people to cycle to work.

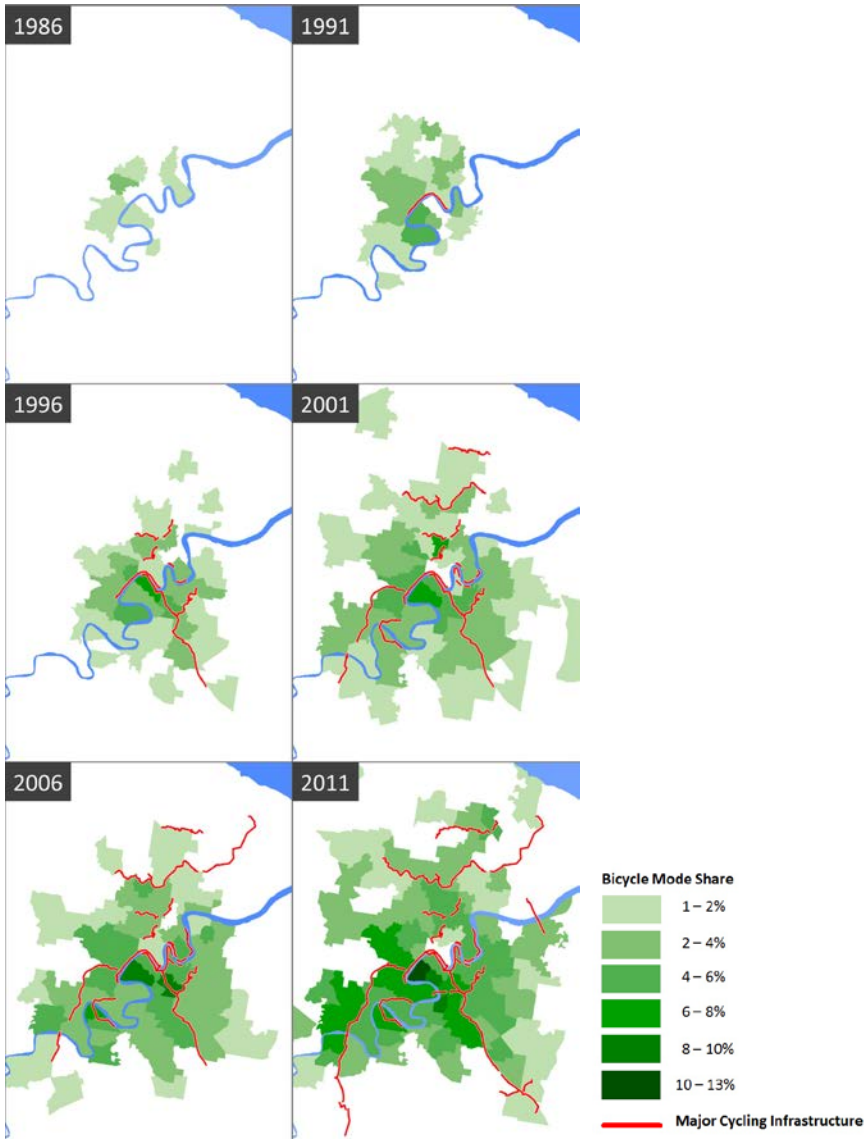


Figure 19: Commute trips to Brisbane CBD by bicycle 1986-2011

Principal Cycle Network Plan

The SEQ Principal Cycle Network Plan was developed in 2007 to inform planning, funding and construction of both state-controlled and local government cycle routes.[28] The PCNP shows the core routes needed to get more people cycling more often. The PCNP supports and informs the planning, design and construction of the cycling network in SEQ. Figure 20 shows an extract from one section of that network plan on the Gold Coast, with the full lines being, at that time, existing principal (blue) and coastal (red) routes and the dotted lines being future principal (blue) and future coastal (red) routes.

[28] Queensland Transport (2007), *SEQ Principal Cycle Network Plan*, November 2007

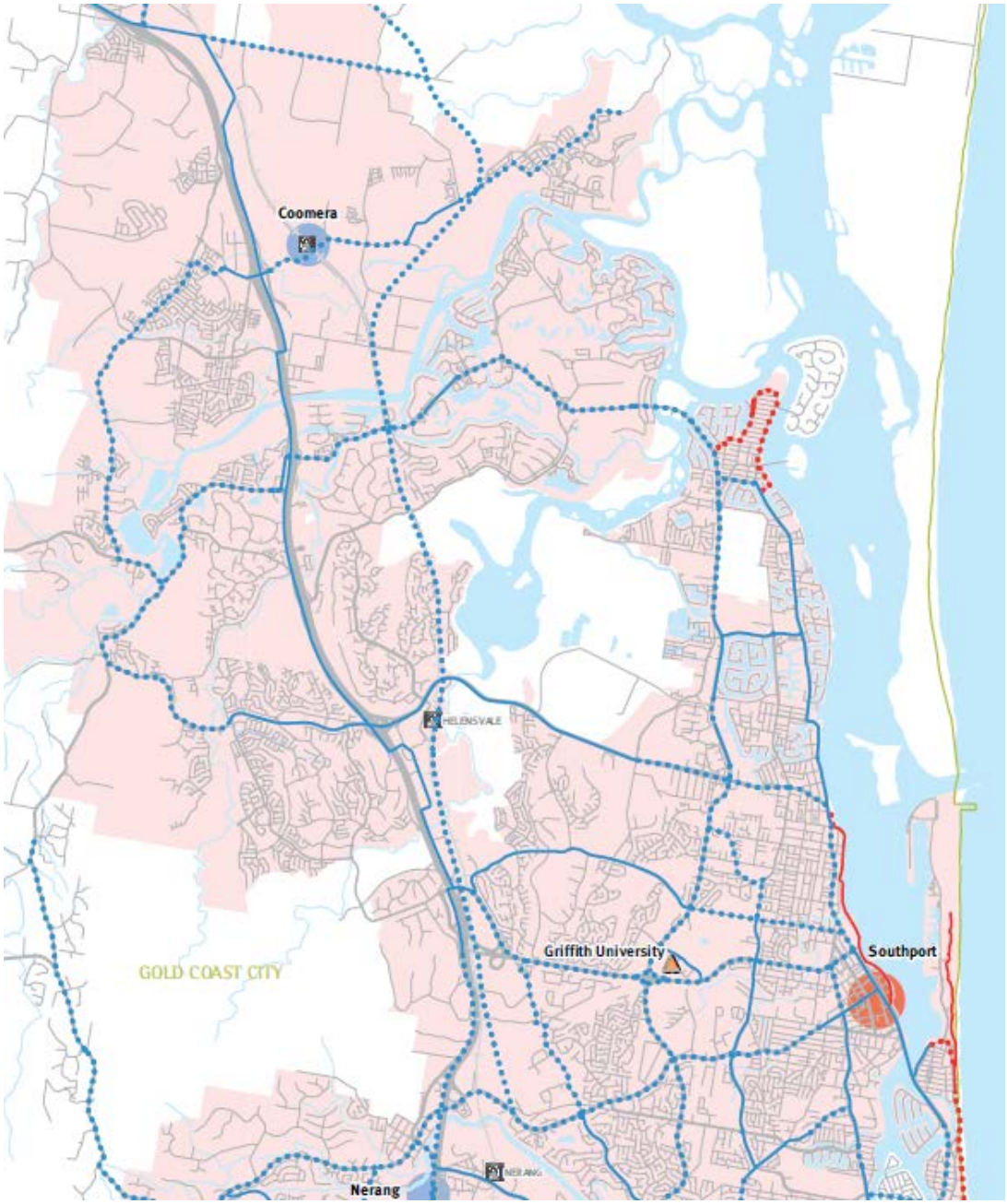


Figure 20: Extract from SEQ Principal Cycle Network Plan 2007

The SEQ PCNP represents a 'one network' approach to cycle network planning and are developed closely with local governments to guide the delivery of a connected and cohesive system network across SEQ.

Relationship between active transport and public transport

A key focus in *ShapingSEQ* is the relationship between active transport and public transport, recognised as typology 2 in table 3.

The TransLink Public Transport Infrastructure Manual 2012 (PTIM) introduced a prioritised hierarchy of access to PT stations and stops. The 2015 update to the PTIM also stated that TransLink supports access to public transport in the following order of priority:

1. walking
2. cycling

3. transferring from another public transport service
4. kiss ‘n’ ride and taxis and park ‘n’ ride (including motorcycles).

As such the access infrastructure is absolutely essential in providing a connection between the public transport facility and the immediate surrounding environment. The encouragement of walk and cycle trips to PT relieves pressure on parking facilities (as well as help manage traffic congestion) and has the added benefit of supporting whole-of-government objectives for more sustainable transport and physically active communities[29].

Walking is highlighted as the preferred and most important mode of access to the TransLink network and pedestrian connections to support this mode of access should be accessible, convenient, direct and legible[30]. Factors that influence active transport connections to public transport include:

- large existing population within 800m walkable distance of the station
- large employment base within 800m walkable distance of the station
- no major Park-n-Ride exists or is planned at the station
- no desolate routes with significant CPTED issues which deters patrons from walking or cycling to the station
- no major physical obstacles (creek, motorways, and poor subdivisional layouts) disadvantage patrons in accessing the station
- terrain within a five km radius surrounding the station is considered gentle for cyclists and
- terrain within 800m radius of the station is considered gentle for pedestrians.

The ability to connect dense mixed land uses with key transit stops efficiently can encourage people to walk or bike to transit. It is important to promote less need for private vehicles, not only to support health and well being but also because of efficiency. It is also vital to identify the ease of public transport and the complimentary role active transport plays on that system. For users to understand the simple association the two modes can have, public transport vehicles need to accommodate for active transport users.

Regional planning policy must support Travel Demand Management approaches which see transit agencies acting beyond the footprints of the PT facilities and plan and programming for the wider catchment. Feeder bus, cycle and walking can all become catchment multipliers delivering greater PT mode share, more satisfied customers and reducing demand for Park ‘n’ Ride facilities[31].

Infrastructure improvements that can increase the attractiveness of a station to a particular mode of transport are outlined below[32]:

- priority cycle lanes on all access roads to the station
- suitable width and condition of all concrete pathways to the station (includes pram ramps at all kerbs)
- infrastructure to improve safety of pedestrians in the vicinity of the station including fences, formal pedestrian crossings, signalisation of intersections and pedestrian crossings
- potential new links/overpasses to shorten distances between residential areas and stations
- CPTED initiatives including CCTV of all approach roads and pathways
- wayfinding signage from surrounding streets.

[29] Public Transport Infrastructure Manual 2015, Department of Transport and Main Roads
[30] Public Transport Infrastructure Manual 2015, Department of Transport and Main Roads
[31] go2team Research Paper SEQ Modal Access Study, 2015, TMR

Freight demands

Enabling efficient freight movement through the Queensland road and rail network is crucial to realising the prosper and connect themes of *ShapingSEQ*. Freight trips in Queensland are ranging from short local to large global freight trips. Brisbane provides the hub for surrounding areas and freight movements from and to Noosa, Toowoomba, Lockyer, Somerset and the Scenic Rim. These areas are important centres to support food supplies, biodiversity, agriculture and natural resources. The anticipated population growth in SEQ will directly lead to a significant increase in the freight and logistics task.

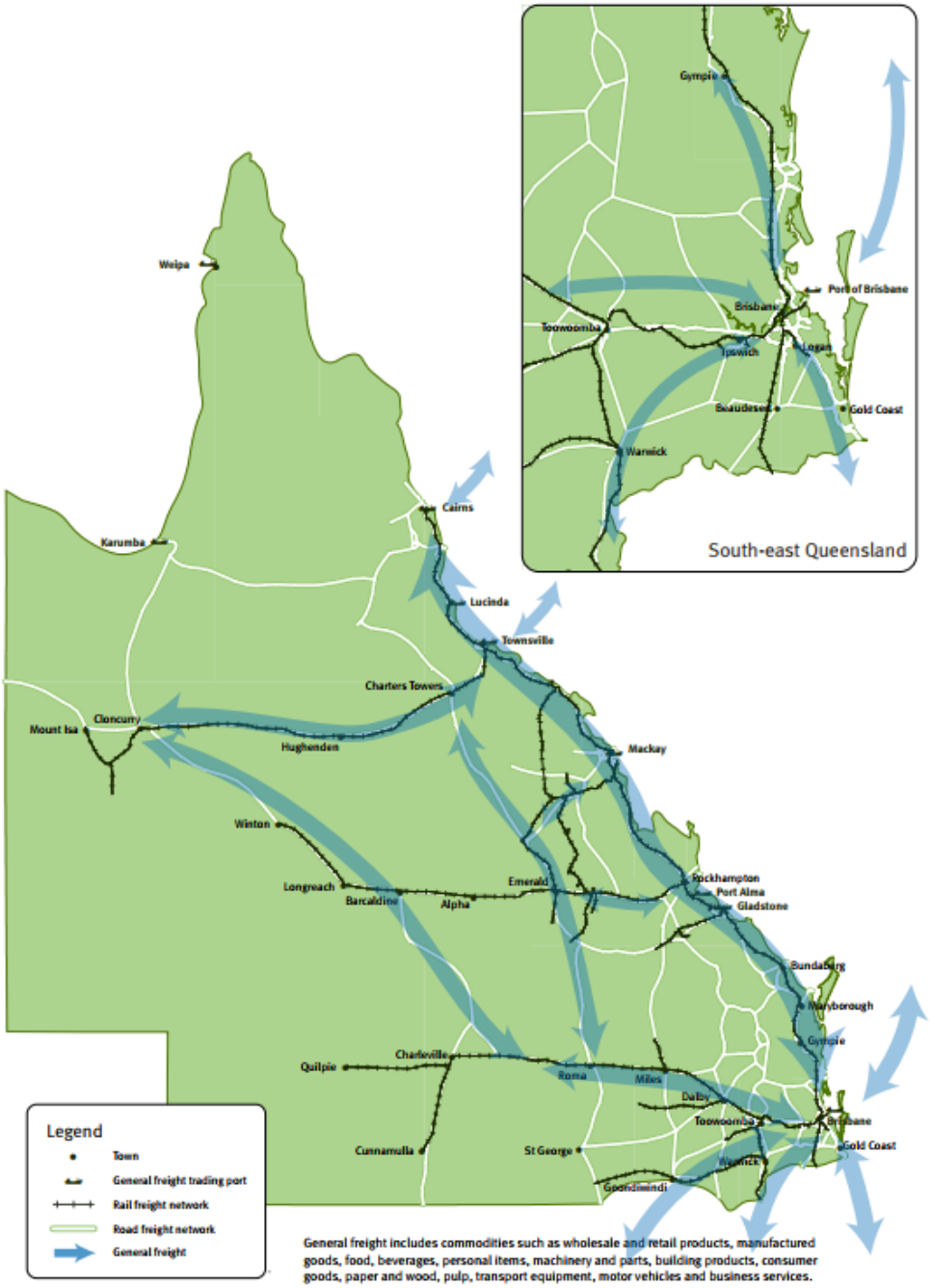


Figure 21: General Freight Movement in Queensland (Source: Moving Freight – Transport and Main Roads, 2013)

Figure 21 shows the freight movements occurring on the existing Queensland infrastructure. It highlights the importance of SEQ as a key hub for freight movements to and from all over Queensland and Northern New South Wales. The Port of Brisbane is the main container port of Queensland importing and exporting the majority of consumer goods for the state. Only Townsville has some minor facilities to cater for containers. The remaining Queensland ports handle bulk freight.

In 2010-11 Queensland total freight volume, comprising export, import and domestic freight movements was 871 million tonne (mt.). This included all types of industries, such as mining, agriculture, building and construction, hospitality and retail, household consumption (food and beverages), accommodation and business services.[33]

In 2016, Freight trips made up around 12 per cent of trips in the transport network in and around Brisbane. Around 45 per cent of these trips are undertaken by heavy vehicles with the remaining trips attributable to light commercial vehicles. [34]

Considering the Australian context, Queensland was the second largest carrier of road freight tonnes in Australia (after NSW) in 2014. The large majority of that road freight was destined within Queensland itself.[35]

The role of freight is anticipated to play an increasingly significant role in the transport system of SEQ. Freight volumes are forecast to grow with correlating population growth in SEQ over the next 25 years. An increase in consumer goods arriving through the ports of Brisbane, Melbourne and Sydney is likely.

This needs to be a key consideration when planning freight corridors and ensuring easily accessible industrial centres, warehouse complexes and intermodal terminals.
In 2010-11, 69 per cent of freight in Queensland was moved on road, 29 per cent via rail, two per cent via sea and 0.01% by air.[36]

Major existing freight corridors in SEQ include the Warrego and Cunningham Highways, the Logan, Gateway and Port of Brisbane motorways, and the interstate rail line to Sydney. The Pacific and Bruce highways also play a significant freight role connecting to the Gold Coast and Sunshine Coast. Although not managed through land use planning processes, the shipping channels, berths and swing basins providing maritime access to the Port of Brisbane are also essential.

In addition to the infrastructure show, the intermodal terminal in Bromelton has started operation in January 2017 and the InterLinkSQ Logistics Centre in Toowoomba is starting Construction in early 2017. Major future freight corridors include:

- the proposed Inland rail link to Melbourne
- the western road bypass of Ipswich between the Warrego and Cunningham highways
- the southern rail infrastructure corridor linking Inland rail to the interstate rail line
- the proposed dedicated freight rail corridor linking the interstate rail line to the Port of Brisbane (under investigation).

Future freight challenges and opportunities

The currently planned Inland Rail corridor from Brisbane to Melbourne, in combination with the Port of Brisbane, and four international airports, provide the opportunity to strengthen Brisbane's position as an inter-global hub, providing a convenient location for freight imports from Asia to the

[33] Moving Freight, Department of Transport and Main Roads, December 2013
[34] BNE Strategic Model 2016, Department of Transport and Main Roads, March 2017
[35] BITRE Australian Road Freight Movements 2014
[36] Moving Freight, Department of Transport and Main Roads, December 2013

rest of Australia and vice versa.

If SEQ is to maximise its economic growth potential, there will be increased demand to use freight networks at the same time as population growth which will increase the use of road space. Challenges that freight networks will face include transport hub bottlenecks, competition for network access, increased congestion, and cost of infrastructure. Encouraging urban residential and commercial development in areas with good access to high-frequency public transport services will also help to minimise the congestion on major road freight routes.

Increasing congestion impacting on national significant freight routes

Numerous freight routes in SEQ are of national significance, such as the Pacific Motorway and Gateway Motorway (M1), Logan Motorway (M2), Ipswich Motorway (M7), Cunningham Hwy (15) and Warrego Hwy. (M2/A2). Continuous traffic growth in SEQ directly impacts on the congestion and travel time on these significant routes. There is the risk that this may lead to delays and cost increases on freight movements through SEQ in turn reducing the viability of these routes.

Another key link in the SEQ freight system is the access to and from the Port of Brisbane. Road and rail access to the port need to be maintained and upgraded suitably to ensure imports and exports via the port will stay viable in the long term.

Specific key issues include the road and rail access to and from the Port of Brisbane and the status of the existing rail line which is preventing an increase in the uptake of rail freight. Additionally, increasing funding in road upgrades further diminish rail advantages.

Integrated planning and prioritisation of freight infrastructure

As trade and population growth place higher demands on the region's roads, dedicated freight rail infrastructure and services will be necessary to support a higher and more sustainable proportion of rail freight to the Port of Brisbane (currently only five per cent). This could also be supported by inland intermodal freight facilities and industrial hubs with rail connections to the port, including new facilities at Bromelton and Charlton Wellcamp, as well as the existing Acacia Ridge.[37]

The Toowoomba Second Range Crossing is a major current project improving road freight transport times to and from Brisbane, while also improving amenity and supporting urban renewal opportunities in central Toowoomba.

The areas remaining in SEQ that are suitable for large scale industrial developments are limited. Therefore, these centres need to be planned carefully, located in the vicinity of freight corridors and most likely at the fringe of existing urban footprints.

In addition to infrastructure improvements, soft measures, such as rail shuttles, urban freight delivery times, interconnected freight centres (instead of individual warehouses) and optimal use of evolving technologies needs to be considered into the future.

Due to the currently low mode share of rail freight, freight transported via rail provides a fantastic opportunity for the future, particularly in increasingly congested road networks.

In the BITRE Report 139 "*Why short-haul intermodal rail services succeed*", it is outlined how intermodal freight hubs on the fringes of centres can consolidate and deconsolidate freight trains to "secure traffic volumes that are required to have competitive line haul costs. It further outlines that this is strengthened when there are constraints in road freight such as congestion. Short haul rail freight shuttles to inland ports may be an opportunity for SEQ.

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[37] Port of Brisbane Pty Ltd (2016*), Port of Brisbane Pty Ltd Submission—Shaping SEQ Planning for the Future*, 29 June 2016

This is also supported by the opportunity to create intermodal distribution centres (instead of individual warehouses) that can more succinctly and efficiently distribute freight. Locating these centres in urban fringe areas can further enhance SEQ's long term plans and economic viability.

Alternatively, increasing road infrastructure for freight or freeing up road space for freight can be an option to maintain freight efficiency. Viewing public transport improvements in light of freeing up space for freight may help to provide funding sources and strengthen financial viability.

Freight priority routes, designated truck routes or lanes and unbundled freight rail networks are expensive infrastructure solutions that would provide ultimate freight priority. On this scale of options to maintain a sustainable network, integrated planning of freight and other modes is crucial ensure the success of SEQ.

Movement of freight volumes

The movement of goods is changing. Online sales and door-to-door deliveries are creating new freight demands for customers within urban areas.[38] Businesses are adjusting to just-in-time deliveries to reduce inventory cost, but this often requires more frequent customised deliveries. The increase in the services sector and knowledge-based economy are expected to increase this demand on our urban distribution systems over time.

Freight is increasingly transported in containers as opposed to bulk, as container freight is more efficient and flexible to transport via truck and rail. Additionally, new larger containers are being used to cater for larger lighter consumer goods, such as clothing plastic toys, etc.

Integrated planning needs to ensure trends are reflected and infrastructure can cater for new demands innovatively. Inland Rail for example is considering double stacking of containers which will significantly improve its loading capacity.

There is currently a lot of uncertainly around the existing and future impact of these changes in movements of goods. This includes trip distances, freight vehicles, loads and delivery times. Additionally, shops increasingly cater for online orders out of their in-house stock. This leads to a new demand of outbound loading for online deliveries on existing predominantly inbound focused loading docks.

Businesses in SEQ that service national and international markets will require access to warehousing, the Port of Brisbane, and one of the four airports that service SEQ (Brisbane, Gold Coast, Sunshine Coast and Brisbane West Wellcamp). This will become increasingly important as the economy transitions to knowledge based, high-value industries.

Development of the proposed inland rail line between Brisbane and Melbourne may change the broader national pattern of freight movement in the long-term, with Brisbane potentially playing an increased role as a trade hub via the Port of Brisbane.[39]

Evolving technologies changing the way we move

Technologies are evolving rapidly. The development of autonomous vehicles is continuing worldwide and trials are being undertaken locally in Queensland. Different forms of automation already existing such as automated cranes at the Port of Brisbane and private vehicles with level two automation. These can warn drivers of obstacles in the blind spot.

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[38] Visser et al (2013), *Home Delivery and the Impacts on Urban Freight Transport: A Review*

[39] Economic Associates, *SEQ Regional Plan: Economic and Employment Supporting Material Final Report*, September 2015

Whilst there are still some questions on the practicality, risks and opportunities around automation, it is certainly expected to change the way we move. In terms of freight, potential future applications include automated trains or trucks as well as freight enabling machinery, such as forklifts and loading equipment.

Furthermore, mobile phones and applications are also expected to disrupt the traditional freight industry with already existing services such as Sherpa ("Everyone's Private Courier"), UBER Freight and Mobility as a Service enabling applications.

Risks around rail freight

Rail freight is underutilised in SEQ at the moment. Although it is an efficient system to move large quantities of freight, a range of reasons have led to a decrease in the uptake of this system, including competing with passenger trains, less flexibility that road freight, investment in road upgrades that make trucks a more attractive alternative.

Future additional risks to rail freight include the following:

- rail freight curfews
- increasing passenger rail
- limited investment in rail upgrades (combined with additional spending on roads)
- sequencing of inter-modal terminals.

Again this highlights the importance of integrated transport planning as one system is directly dependant on all other systems.

Inland rail is anticipated to be a great opportunity for SEQ and potentially increasing freight movements from Asia to Melbourne via the Port of Brisbane. At the same time inland rail opens up SEQ to sea freight from Melbourne, which is currently the larger and busier port.

The current Brisbane connection to Inland Rail is at Acacia Ridge with the existing network to provide the connection to the Port of Brisbane. Whilst rail freight is considered to be underutilised in SEQ and there is sufficient capacity on the existing rail network, the Australian Rail Track Corporation (ARTC) has completed a study identifying options for a new freight route to the Port. Should further more detailed planning not be undertaken there is a risk the full benefits from Inland Rail will not be realised.

Digital communications

Secure, reliable and cost-effective digital infrastructure is fundamental to social and economic development in SEQ, supporting the creation of the knowledge based jobs of the future.

Broadband services and innovations in digital, mobile and cloud technologies are changing the nature of work. Telecommunications can provide alternatives to actual trips. For example, increased data volumes and speeds via the National Broadband Network (NBN) can improve digital communication between workplaces and support increased opportunities to work from home. Such changes can reduce per capita travel demand.

The SIP includes a 'future opportunity' to identify opportunities to increase teleworking in the public and private sectors as a means of reducing congestion on transport networks.[40] The Department of Science, Information Technology and Innovation are in the process of preparing the Queensland Digital Infrastructure Plan, which will outline an approach for better utilisation of government owned or controlled digital infrastructure. However, digital communications are unlikely to in the time

[40] Department of Infrastructure, Local Government and Planning (2016), *State Infrastructure Plan, Part A: Strategy and Part B: Program*, March 2016

frames of the regional plan to significantly replace the need for people to meet face-to-face to facilitate the exchange of knowledge and ideas.

Digital communications can provide improved real-time passenger information, e.g. via the MyTranslink smartphone application, and innovations such as an account-based ticketing system that encourages increased use of public transport over time. This could be supported by a well-synchronised family of transport services, combining infrastructure, services, technology and data to suit the lifestyle and travel needs of the individual. Improved real-time information on roads will also inform road users, including freight movement.

Other urban infrastructure

The relationship between land use and transport is fundamental to the future pattern of urban growth and change, but other infrastructure is also essential to support urban development. Adequate water supply and sewerage networks can significantly affect the feasibility and timing of development in different locations. While they are essential infrastructure, costs for energy provision, digital networks, and core community infrastructure (such as education and health facilities) are less significantly affected by the distribution of growth which is a primary consideration of the regional plan.

Sewer

Resolution of sustainable and affordable sewage effluent treatment and disposal systems and their funding has been a major issue delaying the development of planned expansion growth areas such as Greater Flagstone, Ripley Valley and Caboolture West. This is driven primarily by the community objective to better protect the quality of the region's waterways. It will continue to be a challenge to affordably meet appropriate treatment and disposal standards in a way that supports adequate expansion land supply in a timely manner.

The preferred long-term approach of sewerage providers has been for large centralised waste water treatment plants, with decommissioning of smaller plants and rationalisation of the number of plants over time. However, smaller scale local systems and use of capacity within existing local plants may also occur, particularly for the initial development of any growth areas. This may occur because it is difficult to economically stage infrastructure to transfer sewage long distances and match development take-up rates. There have been some recent trials of this infrastructure undertaken by Queensland Urban utilities which are proving effective in providing sewerage treatment during the early stages of growth.

For particular developments, innovative decentralised systems may have cost and other advantages over the more centralised approach. For example, the proposed Wamuran recycled water irrigation scheme is being investigated to support the more sustainable and affordable treatment and disposal of sewage effluent from the large Caboolture West growth area.

Costs for provision of sewerage are also a common factor in why areas of underutilised Urban Footprint remain largely or partly undeveloped for urban purposes even though they may be zoned for such development. This particularly affects fragmented areas where individual landowners/developers cannot afford to support provision of larger infrastructure for the broader area. Infrastructure providers may also be reluctant to invest in a broader solution given uncertain rates of take-up to recoup costs in an area.

In general terms, sewerage providers have indicated a preference for consolidation development, which more cost effectively uses spare capacity within the existing sewerage network. However, land use planning needs to recognise local infrastructure capacity thresholds.

Water supply

Since the millennium drought (1997–2009), per capita water demand has been maintained at relatively low levels compared to pre-drought times, although it has increased somewhat in recent years. Figure 22 shows consumption generally around 150–170 litres per day compared to about 300 litres per day prior to the drought.[41] This effective water demand management will help to minimise future infrastructure needs.

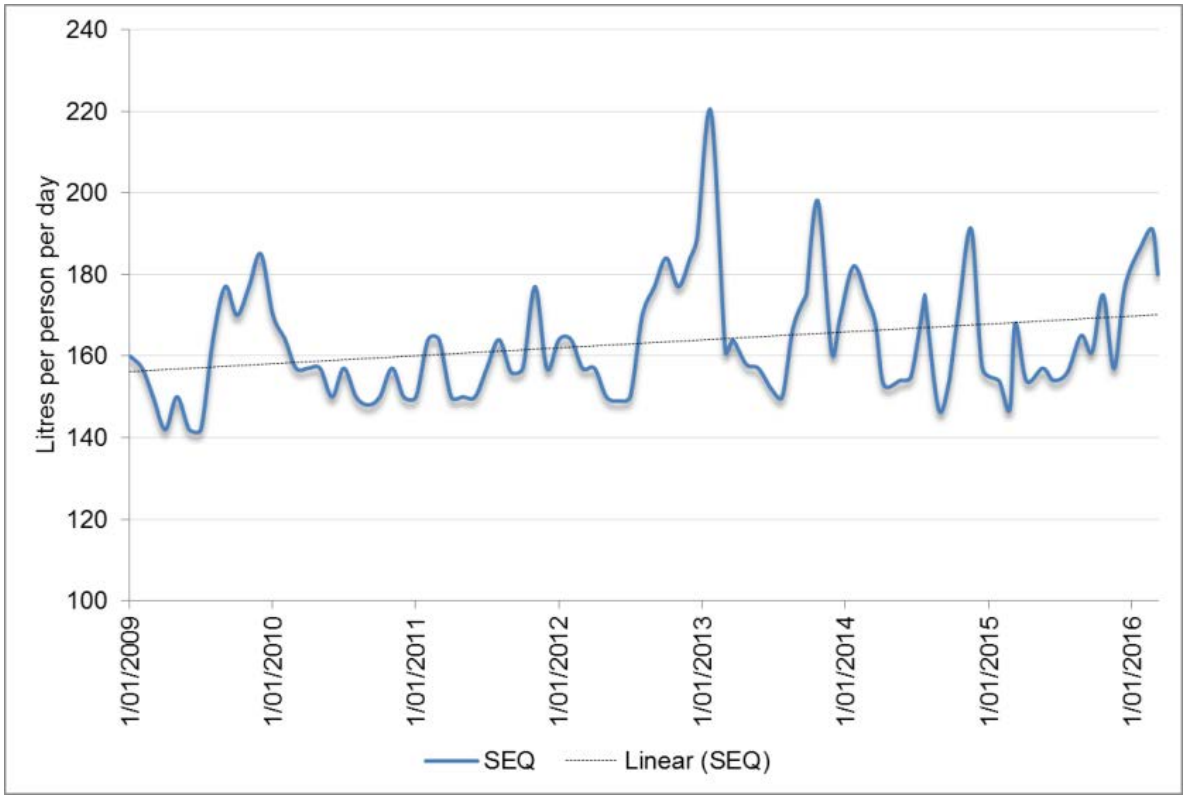


Figure 22: SEQ water consumption 2009–2016

Seqwater has released version 1 of South East Queensland's Water Security Program 2015–2045, identifying the region's future bulk water supply requirements. Under the most likely water demand scenario, the SEQ bulk water supply network is expected to require augmentation of existing water supply assets up to 2030, which will defer the need for a new water source until about 2033.

The northern sub-region of SEQ, including Sunshine Coast and Noosa, will be the first area to require new water supply sources. The water security program identifies options as a basis for future planning, including a combination of measures to harvest surface water from the Mary River or a desalination plant in the northern sub-region.

Beyond the early 2030s, the water security program indicates that at least three water supply source augmentations will be required up to 2045, for which the program identifies a number of surface water and desalination plant options.[42]

As future versions of the Seqwater water security program are developed – informed by community feedback – it will be important that land required for the preferred options for new water supply

[41] Seqwater (2015), SEQ maintains "drought like" water consumption, http://www.seqwater.com.au/latest-updates/news/2015/12/18/seq-maintains-%E2%80%9Cdrought-like%E2%80%99%E2%80%99-water-consumption (accessed 11 July 2016)

[42] Seqwater (2015), *South East Queensland's Water Security Program 2015-2045* version 1

sources and any associated pipeline corridors are protected from incompatible development.

Energy

New technology means there are more ways to make and move electricity more efficiently. Encouraged by the Queensland Renewable Energy Plan, the trend in energy use is towards more decentralised production, including rooftop solar installations as well as other renewable energy plants, e.g. solar and wind farms.

Figure 23 and figure 24 show the recent trend in energy consumption. One in four Queensland households now have rooftop solar systems. This, when combined with emerging improved battery technology, is expected to further reduce the overall load on the electricity network. This will, in turn, reduce or defer the need for major infrastructure upgrades.[43]

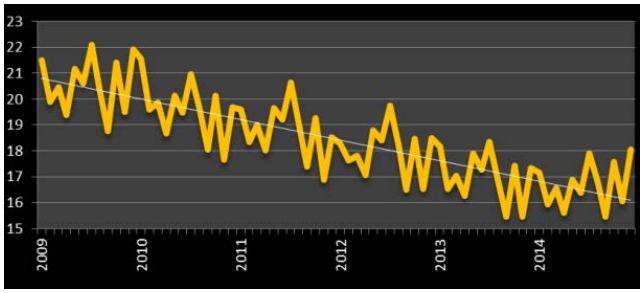


Figure 23: Energy consumption (kWh/customer/day)

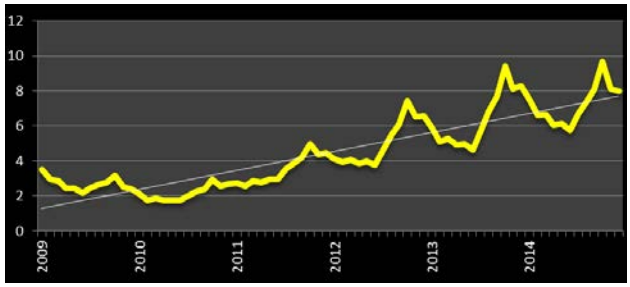


Figure 24: solar generation (kWh/customer/day)

Source: Energex

Social infrastructure

Social infrastructure, which encompasses a broad range of physical assets and services, is important to the long term sustainability and equity within SEQ. Social infrastructure includes a wide range of asset classes which are recognised in the SIP, as:

- health
- education and training
- justice and public safety
- arts, culture and recreation
- social housing.

The planning for each of these asset classes responds to a wide range of drivers and variables including:

- technology
- population growth
- demographic factors such as ageing
- specific change such as health trends
- models for the delivery of services (e.g. in house health services).

As such there are a wide range of planning and service delivery responses from agencies and government to meet the social infrastructure needs of the community in SEQ. The SIP identifies the need for the development of a strategy for social infrastructure. The key objective of the strategy is to take forward the intentions of the SIP across each asset class. It is considered that this strategy and the planning undertaken by individual agencies is the appropriate mechanism for coordination and delivery.

[43] Department of Infrastructure, Local Government and Planning (2016), *State Infrastructure Plan, Part A: Strategy and Part B: Program*, March 2016

Policy directions in *ShapingSEQ*

Approach to managing growth

ShapingSEQ ensures the region can accommodate the growth in a way that:

- minimises the cost of providing new and upgraded roads and public transport infrastructure
- maximises the use of existing infrastructure and minimises the cost of new and upgraded infrastructure of all types
- maximises accessibility between our homes and jobs, education, and other services
- ensures that freight transport is able to support economic growth and service demand generated by our growing population
- avoids or minimises adverse social and environmental impacts
- provides for equitable access to services by all socioeconomic groups.

The region also needs to make better use of the substantial investments in transport infrastructure to help reduce household travel costs, distances and times, while also minimising costs to the taxpayer for new and upgraded infrastructure and services.

In relation to new public transport infrastructure, this might be achieved by better integration of transport project planning and local land use planning to maximise population and employment densities around new public transport stations, as appropriate in the local context. Such planning is generally consistent with existing local government strategic planning, including proposed future local planning investigations, and it is important for that intent to be followed through in the local land use and transport planning process.

With appropriate governance arrangements, this could contribute to the cost of constructing the new infrastructure, either through capture of part of the associated increase in land values or through direct provision of infrastructure elements by developers. Any value capture approach needs to be flagged early and structured so that the market can factor that into land values without adversely affecting development feasibility or the attractiveness of an area for investment. Previous investigations have suggested up to 40 per cent of the land value uplift resulting from decisions to increase planned densities could be captured to support associated infrastructure provision.

As part of the engagement for *ShapingSEQ*, infrastructure stakeholders have noted:

- the importance of staging or sequencing growth to avoid having to service too many fronts at the one time
- the need to proceed cautiously in aiming for higher densities to ensure there is appropriate capacity to service relevant areas.

Spare infrastructure capacity

To maximise the use of existing infrastructure and minimise the costs of new and upgraded infrastructure, we need to make use of spare capacity in existing infrastructure wherever it can support an appropriate pattern of settlement.
Measurement by DTMR of spare seating capacity on the high-frequency passenger transport system identifies the following general opportunities for increased population and employment densities:

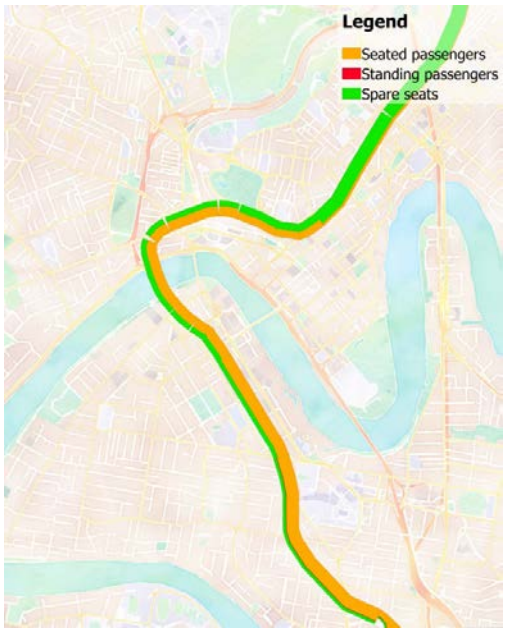
- within three to five kilometres from the Brisbane CBD, spare seating capacity becomes available on services as people begin to disembark for inner city destinations, freeing up capacity within that core area
- related to the above, development might also take advantage of spare seating capacity on services travelling in the reverse direction to peak flow during peak hours and generally in off-peak periods.

Such opportunities will probably continue to exist by location within the transport system, even as

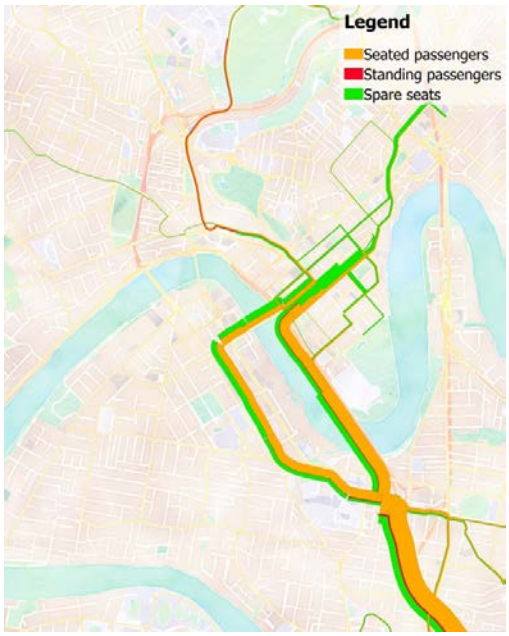
population and employment densities and service demands and levels increase in the future.

Figure 25 illustrates modelling undertaken by DTMR where spare seating capacity exists on particular high-frequency passenger transport services in Brisbane, Gold Coast and Sunshine Coast. Planning for future density increases needs to recognise that already planned development may take up such capacity, prompting the need for additional services. However, innovations such as informing people in real-time about current service capacity could be used to inform better choices about travel options.

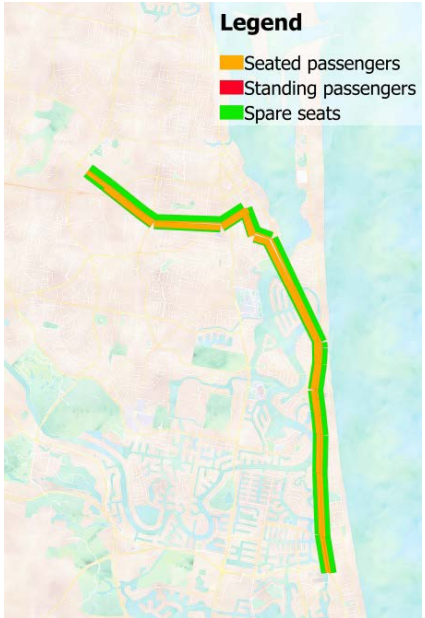
The Land Use and Public Transport Accessibility Index model (provided by DTMR) identifies locations suitable for density increases based on accessibility to key centres using public transport services. Further investigation would be required as part of local planning work to assess relationships between planned density increases and actual service capacity (see figure 26).



Merivale Bridge crossing AM peak inbound



South East Busway AM peak inbound



Gold Coast light rail AM peak

Sunshine Coast Sunbus 600 AM peak

Figure 25: Spare seating capacity on major public transport routes (examples)

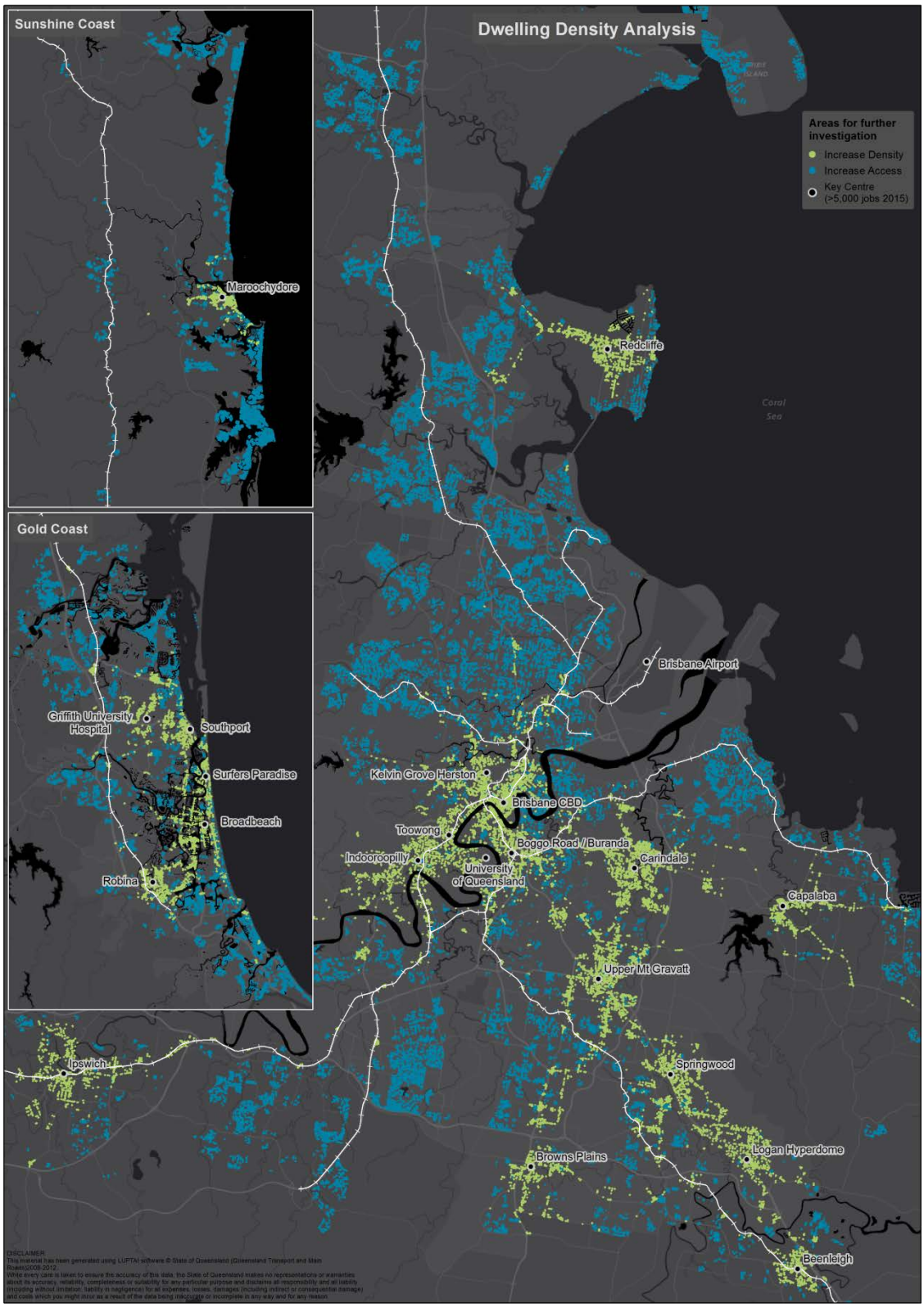


Figure 26: Dwelling density analysis (2015)

The high off-peak travel of people aged over 65 should enable the network to work more efficiently in the future, i.e. with proportionally less peak travel demand from the total, albeit higher, population.[44]

Increased public transport options, e.g. the new Moreton Bay rail link and Gold Coast light rail, and higher frequency services on existing routes, will create increased public transport accessibility over time.

Autonomous vehicles and related changes

Emerging technologies could have a fundamental impact on the transport system and the shape and function of urban areas in the long-term. These include autonomous vehicles, together with the emergence of increased connectedness of all things to the internet, increased use of real-time digital data or 'big data', widespread adoption of electric vehicles, and the ubiquitous nature of mobile communications. Alternative transport service delivery models enabled by technology are also beginning to emerge, such as Mobility as a Service, where a person buys a package of transport including public transport, car share, bike share, and taxi.

There are significant potential savings from transport network optimisation through technological and service delivery improvements. For example, autonomous vehicles have been identified as having road safety benefits and the potential to reduce vehicle nose-to-tail separation and lane widths, which may have the effect of increasing road capacity. However, because autonomous vehicles free drivers for other activities while travelling they will also reduce the perceived time-cost of travel. This may actually increase per capita travel demand and road space requirements, unless a significant proportion of use of autonomous vehicles is through shared rather than individually owned vehicles.[45]

The introduction of many of these technologies and services, such as autonomous vehicles, is likely to occur soon. However, a number of issues need to be resolved – including regulatory, safety and consumer acceptance – before we see a significant proportion of autonomous vehicles on the transport network. Recent modelling by DTMR suggests that autonomous vehicles might not comprise a majority of SEQ vehicles until sometime between 2030 and 2040.[46]

How these new technologies and models of service delivery relate to land use change and planning is yet to be determined. However, there is the opportunity for government and the community to determine a path that will maximise the net benefits of autonomous vehicles and alternative service delivery models. Examples include:

- the potential use of autonomous short-haul mini-buses, taxis or shared vehicles to connect from homes to high-capacity and frequency public transport services to extend the catchment and improve the efficiency of the public transport network
- greater densification around our high-capacity and high-frequency public transport network will support the deployment of these complementary 'micro-transit' services, but they could also connect lower density areas into the mass transit network
- greater use of shared vehicles could significantly reduce the overall number of vehicles required, reducing on and off-street parking and supporting redesign of our streets to become greener, with more space given over to community use, walking and cycling.

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[44] Department of Transport and Main Roads (2016), *How Queensland Travels, A decade of household travel surveys in Queensland*, http://www.tmr.qld.gov.au/Community-and-environment/Research-and-education/Queensland-Household-Travel-Survey-summary-reports.aspx (accessed 1 July 2016)

[45] TransPosition (2016), *Conceptual sensitivity modelling and analysis on the introduction of autonomous vehicles*

[46] TransPosition (2016*), Conceptual sensitivity modelling and analysis on the introduction of autonomous vehicles*

It is likely that freight movement will also be significantly affected by new technologies and business models. Automated heavy vehicles are currently being tested in the United States and Europe. The economic benefits of automation could result in autonomous vehicles penetrating the heavy vehicle market quicker than the private vehicle market.

Automation can also improve the efficiency of rail. Improved automation and drone technology may provide new business models for the local, intrasuburban freight task. The Port of Brisbane has noted the need to consider the adoption of vehicle automation technologies in managing the port's freight challenges in the longer term.[47]

Cross River Rail

The implementation of Cross River Rail is key to achieving elements of regional policy. It will:

- support consolidation development, primarily in Brisbane, due to improved accessibility to the inner city, increased inner urban employment potential, and the attractiveness of residential consolidation locations in Brisbane
- increase transport capacity of the existing rail network, removing inner city constraints
- improve access to concentrated employment areas, particularly the Inner 5km Regional Economic Cluster.
- facilitate greater market access
- attract more business activity, enhancing competition
- increase efficiency and productivity
- improve connectivity within the inner Brisbane area itself, particularly between knowledge and technology precincts and the CBD.

Other future public transport trunk corridors and services

Other proposed public transport corridors and services that would help achieve *ShapingSEQ* policy, and support and potentially expand on the related strategic and local land use planning efforts of local government, include the following.

- Metropolitan subregion:
  - options for improved inner city distribution (to complement Cross River Rail) will support accessibility to and growth of employment in the CBD and frame area which has been identified as the Inner 5km area of regional economic significance (REC).
  - extension of the existing busways, including:
  - the South East Busway to Springwood, including potential new stations at Rochedale and Springwood
  - the Eastern Busway to Carindale, and potentially to Capalaba
  - the Northern Busway to Chermside, and potentially further.
  - provision of bus priority measures from the South East Busway to Browns Plains
  - Extension of high-frequency public transportconnection to planned major expansion growth areas, including Greater Flagstone, Caboolture West and Yarrabilba.
- Western subregion:
  - extension of high-frequency public transport connection from Springfield to Ipswich via Ripley Valley. This would support an increased rate of take-up of planned expansion growth, including higher density development close to planned stations and strengthen economic and social connections within the sub-region.
- Southern subregion:
  - extension of light rail on the Gold Coast (stage 3 from Broadbeach to Coolangatta).
  - high-frequency public transport connections from Broadbeach to Robina.

[47] Port of Brisbane Pty Ltd (2016), *Port of Brisbane Pty Ltd Submission—Shaping SEQ Planning for the Future*, 29 June 2016

- Northern subregion:
  - delivering the Maroochydore–Caloundra passenger transport trunk corridor (light rail, or other service), supported by linking to the heavy rail at Beerwah.

The effect of these proposed public transport corridors and services might be achieved initially or even in the longer-term by adopting alternative approaches/modes for passenger transport services. Figure 27 shows an indicative overall high-frequency network contemplated for SEQ in 2031 as part of the SEQ passenger transport strategy.[48]

[48] Department of Transport and Main Roads (2016), *Future directions: SEQ Passenger Transport (Draft)*, February 2016

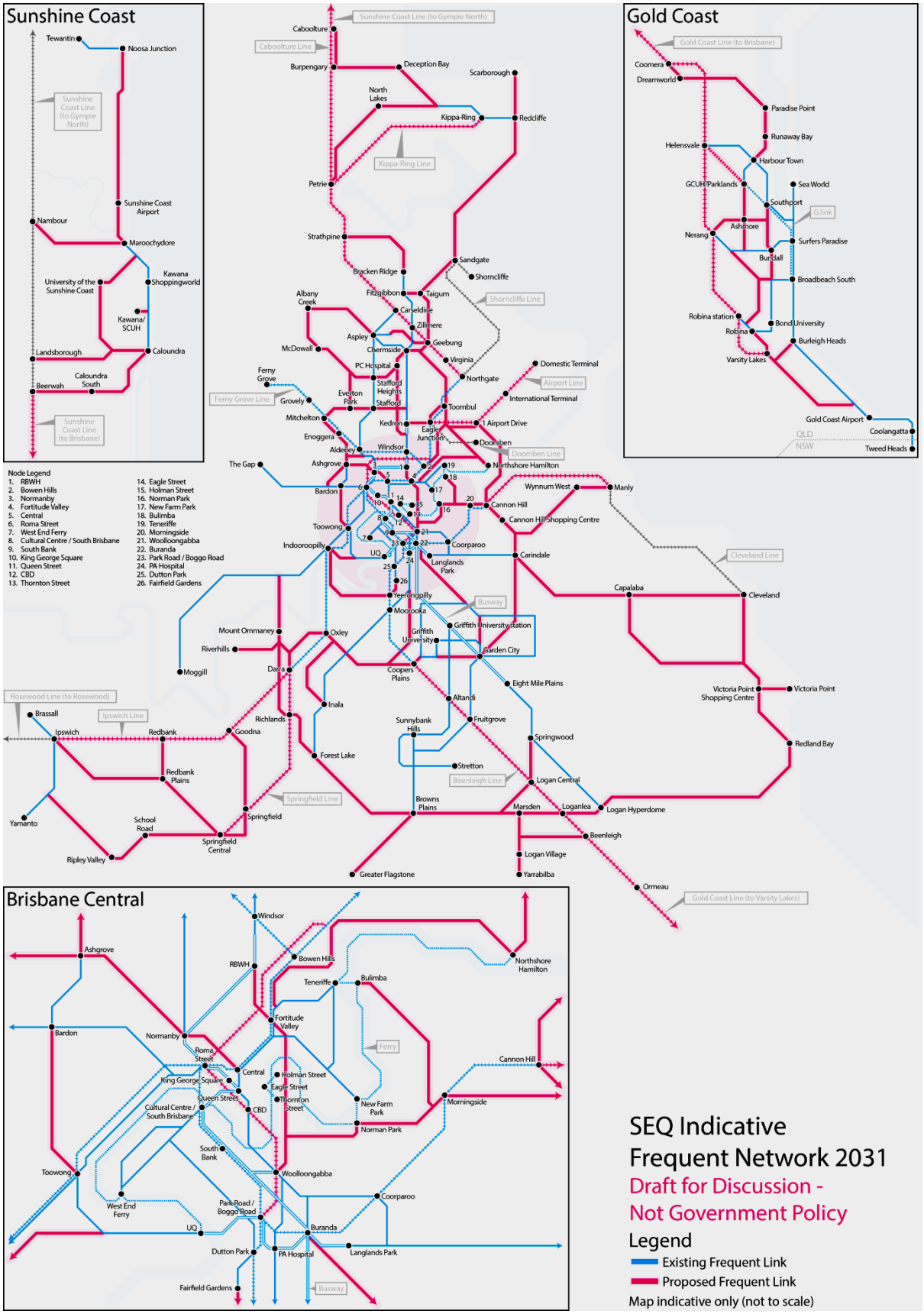

Figure 27: SEQ indicative future high-frequency passenger transport system

Catalytic infrastructure funding

Appropriate funding through the Queensland Government's Catalyst Infrastructure Program, or a similar commitment, could help to unlock development to support the *ShapingSEQ*'s policies. This could include helping areas of Underutilised Urban Footprint (UUF), consolidation locations, and planned growth areas to overcome particular infrastructure feasibility issues or capacity thresholds to provide the expected supplies of dwellings and employment. UUF is land previously identified in the Urban Footprint that may be suitable for urban development, which, due to a range of factors, remains undeveloped. Unlocking areas of UUF to expedite development is an implementation action of *ShapingSEQ* and catalytic infrastructure funding is identified as key action to facilitate this.

Best practice planning

In considering how to satisfy an identified service need, in an environment of constrained government finances, the SIP identifies the following order of preference for available options:

1. Reform of existing institutions and laws, including land use planning controls (such as *ShapingSEQ* and local planning schemes).
2. Better use of existing infrastructure by influencing demand rather than building new infrastructure.
3. Improve and augment existing infrastructure through relatively low cost works.
4. Build new infrastructure as the last option.[49]

The policy of *ShapingSEQ* has a significant role to play in supporting choices in this order of preference. Encouraging growth in locations where we can make better use of existing infrastructure is a fundamental role of *ShapingSEQ* that will minimise the costs for new and upgraded infrastructure. However, some provision of new and upgraded infrastructure will be necessary over time to support appropriate options and locations for growth to provide a diversity of living environments in accordance with community preferences.

The SIP also identifies a future opportunity (cross-government opportunity 2) to incentivise the sequencing of the delivery of new growth areas to maximise the use of existing infrastructure and manage capital expenditure on new infrastructure (DILGP 2016a). Subject to the scope of new growth areas, *ShapingSEQ* could help to prioritise infrastructure investment in accordance with this opportunity.

The Australian Government's Smart Cities Plan champions the concept of a '30 minute city'. This idea promotes planning for cities where residents can access employment, schools, shopping, services and recreational facilities within 30 minutes of home.[50] The average existing SEQ work commuting times reported in this paper are 30 minutes, although commuting to the Brisbane CBD takes significantly longer (average 50 minutes). Public transport trips are also currently significantly longer on average than those by private vehicle.

Region-shaping infrastructure

Infrastructure demands and costs over time can be minimised by appropriate sequencing of development through priorities given to infrastructure investment in some areas ahead of others, e.g. the existing urban and planned growth areas ahead of any new growth areas.

Based on their capacity to help shape the region in a way sought by the regional plan's settlement pattern and other policies, priority region-shaping infrastructure are identified in table 9 of

[49] Department of Infrastructure, Local Government Planning (2016), *State Infrastructure Plan, Part A: Strategy and Part B: Program*, March 2016

[50] Australian Government (2016), *Smart Cities Plan*, Department of Prime Minister and Cabinet

ShapingSEQ. These key infrastructure priorities will inform future iterations of the SIP. By identifying regionally-significant infrastructure projects, *ShapingSEQ* set an agenda that can be reflected in the SIP Program and drive investment in infrastructure that will get significant return on investment in the form of a sustainable settlement pattern.

Priority region-shaping infrastructure meet the following set criteria:
1. fundamental to realisation of the land use pattern set in *ShapingSEQ*
2. fundamental to the movement of people to access employment and the movement of goods
3. has a significant funding requirement across multiple levels of government.
4. is of regional economic significance.

Of the projects identified as priority regional shaping infrastructure, Cross River Rail is included on Building Queensland's Pipeline of Priority Proposals (June 2016) and as a near-term high priority initiative on the Infrastructure Australia Priority List (February 2016). The dedicated freight corridor to the Port of Brisbane is also a near-term high priority initiative on the Infrastructure Australia list and inland rail is a longer-term priority initiative on that list. None of the other projects are included on either list. However, it is a role of *ShapingSEQ* to inform what is considered for, and identified as, a priority project, or otherwise reflected in the SIP, in future years.

Priority region-shaping infrastructure identified have the greatest scope for shaping the region, and are therefore priorities for implementation of *ShapingSEQ*. However, priority region-shaping infrastructure does not present a finite list of projects required to facilitate growth in SEQ. Other infrastructure, including some major new or upgraded roads and other passenger transport links and services, will need to be provided to support existing uses and growth across the region. This will be informed by transport modelling, investigations, planning and funding priorities over time and will also be informed by the RTPs currently under development by TMR.

By identifying regionally-significant infrastructure projects *ShapingSEQ* seeks to set an agenda that can be reflected in the SIP Program and drive investment in infrastructure that will get significant return on investment in the form of a sustainable settlement pattern. Region-shaping infrastructure identified in *ShapingSEQ* highlights clear infrastructure priorities.

Conclusion

ShapingSEQ sets out the long-term vision for the sustainable management of growth of the region and will establish a regional and sub-regional framework to achieve this long-term vision. This paper has provided the basis for the development of the connect policy framework of *ShapingSEQ*. It demonstrates the overwhelming benefits of prioritising a public and active transport system, including the need to make the most of our existing infrastructure networks. Changing our transport priorities will be necessary if the region is to achieve a more sustainable, healthier and fairer transport system that also meets the needs of a growing population and an increasingly competitive economy.

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