




Australian Government
Commonwealth Grants Commission

2025 Methodology Review

Transport consultation paper

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Overview of category

- 1 The transport assessment covers state and territory (state) expenditure on bus, light and heavy rail (passenger and freight), ferry services, air transport, ports and other maritime related services.
- 2 Urban transport and non-urban transport have different drivers of need and are assessed differently.
- 3 Recurrent expenses include subsidies paid to transport operators, the cost of passenger concessions, administration expenses and student transport expenses. User charges (mainly passenger fares) are netted off these expenses.
- 4 In addition to being discussed in the Investment consultation paper (due to be released in October 2023), investment needs for transport are also briefly discussed in this paper, due to the relative importance of investment to total transport expenditure.
- 5 States provide urban transport services using a mix of direct general government provision, public non-financial corporation provision or by contracting private providers. Non-urban transport services are provided mainly by contracted private providers and public non-financial corporations. The transport category includes urban transport public non-financial corporation expenditure.¹ This is because transport public non-financial corporations depend on government funds to meet their operating costs and make major investments, and government departments decide the level of service provision and charges.

Current assessment method — 2020 Review

Urban transport recurrent expenses

- 6 The urban transport assessment includes operating expenses (including depreciation) for passenger transport services within urban centres, net of revenues. It includes expenses of relevant general government agencies and public non-financial corporations.
- 7 The urban transport assessment recognises, as drivers of state expenditure needs, the effects of:
 - urban centre characteristics
 - state shares of urban population
 - differences in wage costs between states.
- 8 The effects of urban centre characteristics and state shares of urban area population are blended in the assessment. The assessment of urban centre

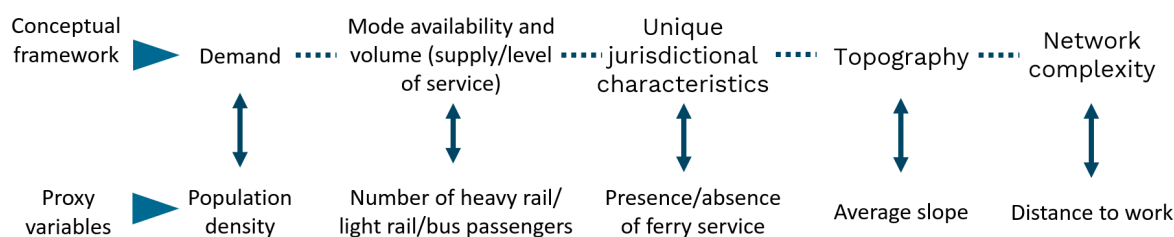
¹ Transport and housing are the only categories to include public non-financial corporation expenditure.

characteristics is given a weight of 75% and state shares of urban population 25%. Differential state wage costs are then applied.

Urban centre characteristics

- 9 Urban areas (see Attachment A) have different public transport costs that go beyond simple differences in population. For example, uneven terrain makes it more expensive to build train lines.
- 10 In the 2020 Review, the Commission engaged a consultant² to develop a regression model to identify the drivers of costs associated with providing transport services in urban areas³ (see Attachment A). The urban centre characteristics identified as the drivers of costs were:
- demand for public transport
 - transport supply by mode
 - unique jurisdictional characteristics
 - topography
 - network complexity.
- 11 Figure 1 shows the variables that are used to represent these characteristics in the regression model. The regression uses net per capita state expense data by urban area to derive the impact of each variable.

Figure 1 Urban centre characteristics recognised in the transport regression model and the explanatory variables used to represent them



Source: The Commission.

- 12 In updates following the 2020 Review, the estimated regression coefficients have been held constant and have been applied to updated modelled urban transport passenger numbers by mode (heavy rail, light rail and bus) and population weighted density in each urban area. If an urban area starts providing ferry services this is also captured in an update. Details about the current method of assessing urban transport expenses are provided in Attachment A.

² Jacobs and Synergies Economic Consulting, [Urban Transport Consultancy Stage 2 – Final Report](#), Commonwealth Grants Commission, 25 October, 2018.

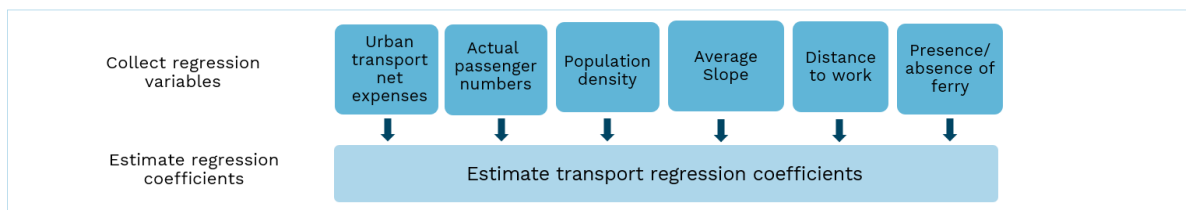
³ The assessment uses the ABS definition of an urban area – Urban Centre and Localities contained within Significant Urban Areas.

Non-urban transport recurrent expenses

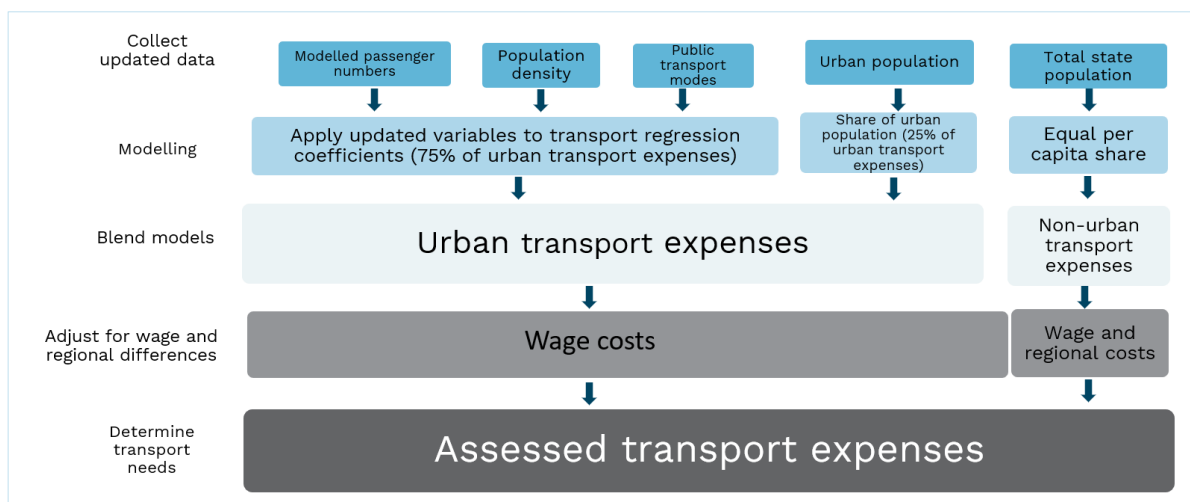
- 13 The non-urban transport component includes general government operating subsidies expenditure for passenger and freight transport. The majority of expenses relate to the provision of non-urban rail passenger services.
- 14 The non-urban transport assessment recognises, as drivers of expenditure needs, the effects of:
 - state shares of total population (equal per capita assessment)
 - differences in costs associated with providing services to different regions
 - differences in wage costs between states.
- 15 Total state population shares are used rather than non-urban population shares. This is because non-urban transport services can be accessed by people living in both urban areas (for both regional travel and travel between urban centres) and non-urban areas.
- 16 Figure 2 shows how state recurrent transport needs are assessed.

Figure 2 Stylised representation of the recurrent transport assessment method

Held constant between reviews:



Updated annually:



Source: The Commission.

Transport investment

- 17 The urban transport investment assessment recognises:
 - urban centre characteristics
 - state shares of squared urban populations.⁴
- 18 The share of squared urban populations is used to recognise the relationship between state per capita urban transport asset needs and its urban population.
- 19 The effects of urban centre characteristics and state shares of squared urban populations are blended in the assessment. The assessment of urban centre characteristics has a weight of 75% and states' shares of squared urban population is weighted at 25%.
- 20 Non-urban transport investment needs are assessed on an equal per capita basis.
- 21 A consultation paper on the assessment of state investment needs in the 2025 Review will be released in October 2023.

Data used in the assessment

- 22 The assessment draws on a range of data from the Australian Bureau of Statistics (ABS), state budget data and topography information from Geoscience Australia.
- 23 The data used in the regression to model urban centre characteristics are held constant between reviews:
 - net expenses for public transport by urban centre (states)
 - measures of population and area used in density calculation (ABS population and geography data)
 - actual public transport passenger numbers (ABS population and census journey to work data)
 - distance to work (ABS census distance to work data)
 - topography (Geoscience Australia).
- 24 The following data are updated annually:
 - population of urban areas (ABS population data)
 - measures of population used in density calculation (ABS population data)
 - modelled passenger numbers (using updated ABS population and census journey to work data)
 - public transport modes – the addition of a ferry service (state data)
 - adjusted budget (ABS Government Finance Statistics and state budget data).

⁴ A state's share of squared urban populations is its urban population multiplied by its urban population relative to other states. This is needed as investment *per capita* is linearly related to population.

Category and component revenue

25 The assessment separately considers state expense and investment needs for:

- urban transport
- non-urban transport.

26 Table 1 shows each state's expenditure on transport (recurrent and investment). The transport assessments account for approximately 12% of total state expenditure.

Table 1 Transport expenditure by state, 2021–22

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
Recurrent expenses	6,001	5,322	2,942	1,681	562	101	234	76	16,920
Investment	7,907	8,562	1,355	698	333	-10	70	64	18,978
Proportion of total expenditure (%)	16.2	20.3	7.2	6.3	4.7	1.4	5.3	2.5	12.4

Source: Commission calculation, 2023 Update.

27 Table 2 shows transport expenditure over time. It has been growing as a proportion of state spending.

Table 2 Transport expenditure, 2018–19 to 2021–22

	2018-19	2019-20	2020-21	2021-22
Total expenditure (\$m)	22,219	24,627	27,950	35,590
Proportion of total expenditure (%)	9.3	10.8	11.1	12.4

Source: Commission calculation, 2023 Update.

28 Table 3 shows the size and drivers of each component within the recurrent transport assessment.

Table 3 Category structure, transport^(a), 2021–22

Component	Component expense (a)	Driver	Influence measured by driver
	\$m		
Urban transport	15,168	Urban centre characteristics	Demand for and cost of providing urban transport, and city specific characteristics, using population-weighted density, the use and presence of a public transport mode, distance to work and topography (weighted 75%)
		Urban population	The proportion of the state population living in urban centres (weighted 25%)
		Wage costs	Recognises the differences in wage costs between states
Non-urban transport	1,752	Population	This is an equal per capita assessment
		Regional costs	Recognises the differences in the cost of providing services to different areas within a state
		Wage costs	Recognises the differences in wage costs between states

(a) Component expenses relate to state recurrent expenses (including depreciation).

Source: Commission calculation, 2023 Update.

GST distribution in the 2023 Update

- 29 Table 4 shows the GST impact of the transport recurrent and investment assessments. The combined impact of the transport assessments distributed \$3,485 million (\$132 per capita) away from an equal per capita distribution in the 2023 Update.
- 30 In the 2023 Update, the assessment of recurrent transport expenses was the third largest expenditure category in terms of moving GST away from an equal per capita share. It was the seventh largest category overall (after mining, stamp duty, health, investment, land tax and Commonwealth payments). Investment in urban transport was the second largest component in terms of moving GST away from an equal per capita share in the investment category (after investment in rural roads).

Table 4 GST impact of the transport assessments, 2023–24

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total effect
Urban transport (\$m)	1,473	469	-897	-280	-330	-261	-66	-107	1,942
Urban transport investment (\$m)	1,280	248	-696	-31	-309	-275	-97	-120	1,528
Non-urban transport (\$m) (a)	2	-4	-3	6	-3	-1	1	2	11
Non-urban transport investment (\$m)	-2	-2	2	2	0	0	0	0	4
Transport (\$m)	2,752	711	-1,595	-303	-641	-537	-162	-226	3,485
Transport (\$pc)	333	105	-294	-107	-346	-918	-344	-868	132

(a) Non-urban transport is assessed on an EPC basis, but the wages and remoteness common factors cause a small redistribution.

Source: Commission calculation, 2023 Update.

- 31 Further detail on service provision arrangements, the scope of the adjusted budget and the underlying conceptual cases for the assessment methods are explained in volume 2, chapter 21, [Report on GST Revenue Sharing Relativities, 2020 Review](#).

What has changed since the 2020 Review?

COVID-19 affected urban transport service provision and use

- 32 Lockdowns and working from home arrangements resulted in a sharp decline in public transport use. To minimise transmission of COVID-19, states largely maintained public transport frequency. States' net expenses increased as a result.
- 33 Despite pandemic restrictions being removed, public transport use has not returned to pre-COVID-19 levels. This is likely due to a rise in working from home and an increase in commuters using private transport. A fall in net internal migration to urban areas, particularly in cities with extended or frequent lockdowns, has likely resulted in a further fall in the number of urban public transport commuters.

34 It is too soon to say whether these changes will result in a structural change to commuter behaviour.

2021 Census data do not reflect normal circumstances

35 In June 2022, the ABS released the first stage of data collected from the 2021 Census. This included data on the method of travel to work by mode. In April 2023, the ABS released census distance to work data.

36 The 2021 Census was conducted during a period of COVID-19 lockdowns in New South Wales, Victoria, Queensland and the ACT. This means data collected on the method and distance travelled to work reflect a time when demand for public transport was low.

Urban centre boundaries and populations have changed

37 Since 2020 there have been changes to the populations within urban centres. For example, Sydney has grown from 4.5 million in 2016 to 4.8 million in 2021, Melbourne from 4.4 million to 4.7 million and Brisbane from 2.2 million to 2.4 million. The geographical size of urban areas has also changed, including the extension of the Melbourne urban area to include Melton (increasing the size of Melbourne from 6,189 to 6,455 square kilometres).

38 The ABS updated the classification of significant urban areas following the 2021 Census. Updated estimated resident population in significant urban areas is also available.

Urban transport networks have changed

- 39 Since 2020 there have been changes to state transport networks, including:
- expansions to existing networks, including the Sydney Metro Network and Western Australia Morley-Ellenbrook Line
 - the addition of new modes, such as light rail in the ACT and Newcastle and the new ferry in Hobart.

Non-urban populations have changed

40 Since the 2020 Review, populations in non-urban areas have increased at a faster rate than in urban areas. In particular, there has been a significant net internal migration out of Sydney and Melbourne. Typically, this is somewhat offset by natural population growth and overseas migration. However, during the pandemic there was a significant decrease in the number of arrivals both from overseas and internally to these cities. As a result, Melbourne experienced a population decline from 2020 to 2021 and non-urban populations became proportionally larger.

- 41 According to the Australian Centre for Population, this is likely to be a temporary shift in internal migration, with numbers expected to return to the baseline trend in 2023 and 2024.⁵ In the long term, some experts argue the increase in people working from home will result in a slight shift in migration towards rural areas but there is no consensus on this issue.

Implications for assessment

- 42 The Commission has identified several issues for consideration, primarily affecting urban transport.
- To what extent has the experience of COVID-19 challenged the underlying assumptions of the urban transport assessment?
 - Are reliable data available to update the assessment of urban transport needs?
 - What are the implications of changes to urban centre size and populations?
 - What are the implications of additions to networks and new modes of transport?
 - What are the implications of changing non-urban populations?

To what extent has the experience of COVID-19 challenged the underlying assumptions of the urban transport assessment?

Impact of COVID-19 on demand, supply and state expenditure

- 43 The experience of COVID-19 changed the way people interact with urban transport services. Consistent with international trends, the increase in remote working in cities subject to lockdowns has increased the propensity for employees to work from home.⁶ Likewise, a greater awareness of social distancing increased the proportion of commuters choosing private travel methods. This was highlighted in a research paper by the Productivity Commission, which identified a decline in the use of public transport in favour of private modes of transport and a decline in fare revenue received as a proportion of operating expenses.⁷
- 44 The change in the use and provision of public transport systems can be seen through the available data on public transport use, working from home arrangements and public transport supply.

⁵ Australian Centre for Population, [Anticipating the impact of COVID-19 on internal migration](#), Centre for Population website, n.d., accessed 1 June, 2023.

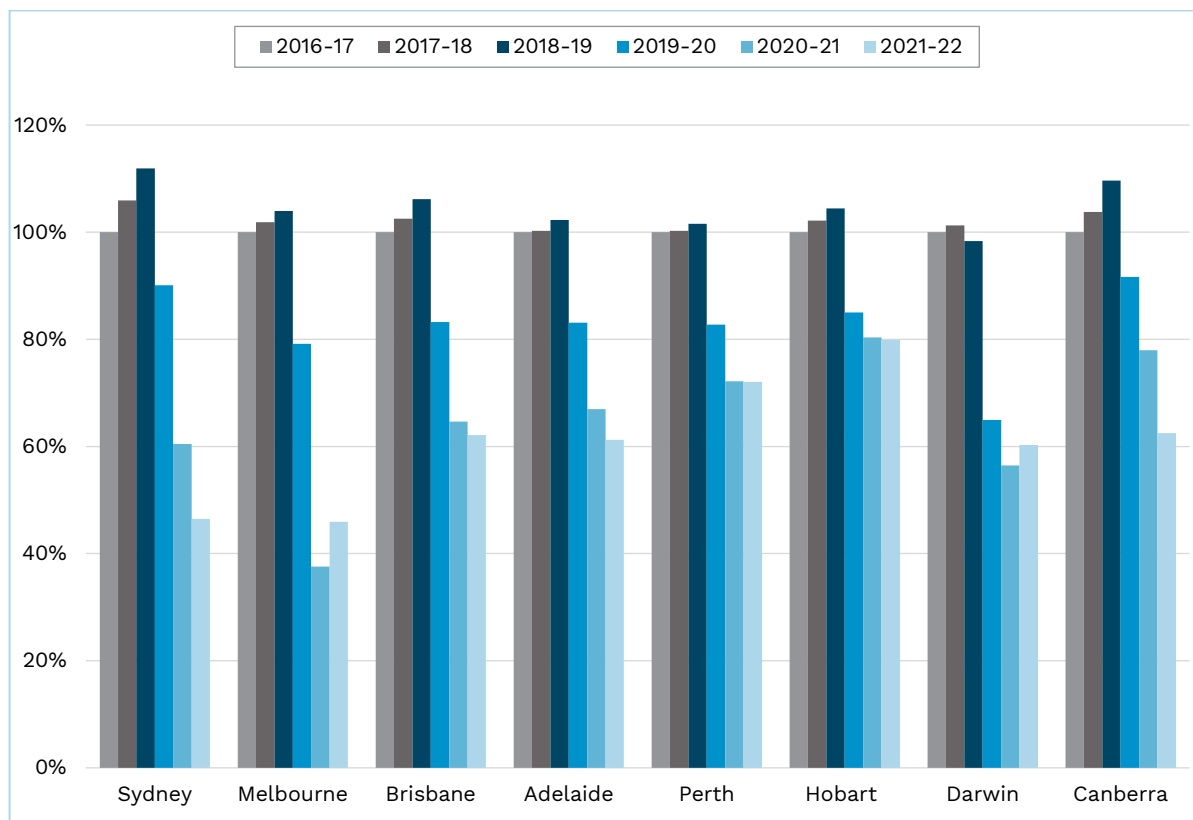
⁶ C. Atsoy et al., [Working from Home around the World](#), Brookings, September 2022.

⁷ Productivity Commission, [Public transport pricing](#), December 2021.

Supply and demand

45 Data on the total passenger kilometres travelled on public transport were obtained from the Bureau of Infrastructure and Transport Research Economics.⁸ The annual changes in passenger kilometres travelled are presented in Figure 3.

Figure 3 Public transport use in kilometres travelled compared with 2016–17 levels



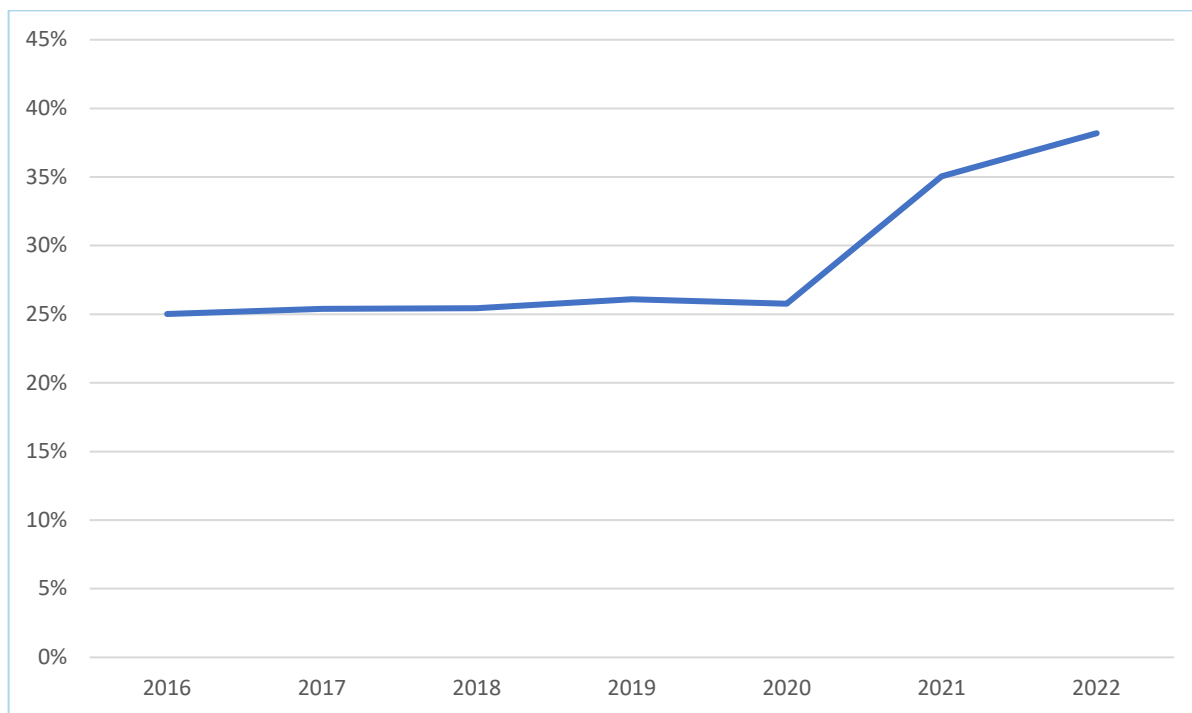
Source: Commission calculations based on Bureau of Infrastructure and Transport Research Economics data.

46 According to the data, the capital cities in all states have experienced decreases in demand for public transport since the beginning of the pandemic. This decrease in demand was not evenly distributed among the states.

47 The fall in demand coincided with the increased prevalence of working from home arrangements. Data from the Household, Income and Labour Dynamics in Australia survey indicate that working from home has become more common since the onset of the pandemic (Figure 4).

⁸ Bureau of Infrastructure and Transport Research Economics (BITRE), *Australian Infrastructure and Transport Statistics – Yearbook 2022*, 16 December 2022.

Figure 4 People working from home for at least 1 hour per week



Source: Household, Income and Labour Dynamics in Australia data.

- 48 Working from home arrangements are also likely to have changed the use patterns of commuters within urban areas. For example, there has been reduced demand for main commuter services into and out of city centres. The long-term pattern of working from home and the implications for demand are not yet known.
- 49 To identify trends in the supply of public transport services, the General Transit Feed Specification data for several capital cities can be used.⁹ Table 5 shows that between 2016 to 2019, public transport services grew by 8% across capital cities. In 2020, service levels fell below 2019 levels and had not recovered by August 2022.
- 50 At a national level, service provision decreased slightly during the years most impacted by COVID-19 (2020 to 2022). The decline in services was not equivalent to the decline in demand, indicating that service levels were maintained to allow for COVID-19 safe travel, especially for essential workers who could not work from home.

⁹ General Transit Feed Specification (GTFS) data provides real time tracking of public transport services. Analysis does not include data for Hobart and Darwin.

Table 5 Change in public transport services available by capital city, 2016 to 2022^(a)

	Sydney	Melbourne	Brisbane	Perth	Adelaide	Canberra	Total
	millions	millions	millions	millions	millions	millions	millions
August 2016	44.4	32.5	11.2	15.4	11.0	3.2	117.8
August 2019	51.9	33.4	11.7	16.2	10.5	3.5	127.2
August 2020	48.9	32.5	10.8	15.3	10.1	3.7	121.5
August 2021	52.5	32.7	11.6	15.7	10.4	3.8	126.7
August 2022	51.2	31.9	11.0	16.3	10.4	3.7	124.6
Change 2016 to 2019 (%)	16.9	2.7	4.2	5.0	-5.2	11.9	8.0
Change 2019 to 2022 (%)	-1.4	-4.3	-6.0	0.8	-0.3	4.9	-2.0

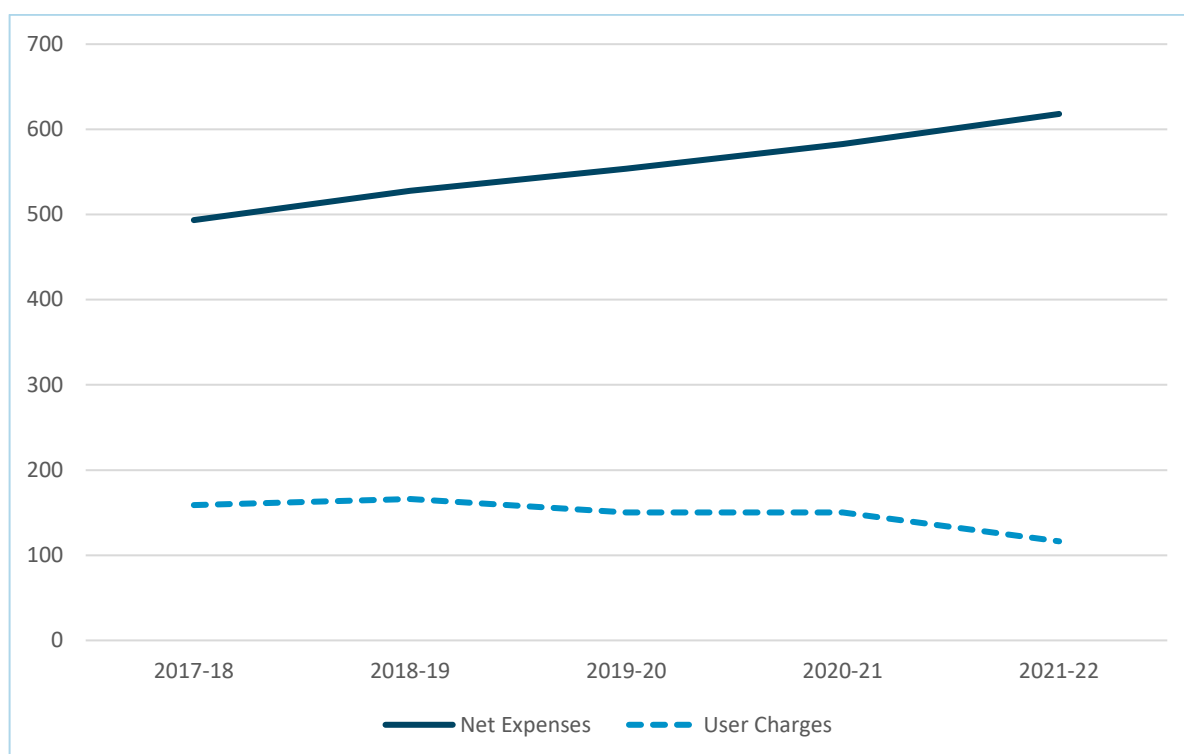
(a) Calculation based on stops per service multiplied by the number of days a service runs.

Source: Commission calculation based on General Transit Feed Specification data (accessed 9 March 2023).

Net expenditure

51 In the 2023 Update, the Commission noted that net recurrent spending on urban transport increased by 39% between 2017–18 and 2021–22 (Figure 5). Part of this increase reflected a decrease in public transport use, and hence in fare revenues collected, during the pandemic.

Figure 5 Changes in net expenses and user charges, urban transport



Source: Commission calculation using ABS Government Finance Statistics data and state provided data.

To what extent has the experience of COVID-19 challenged the urban transport model?

52 The Commission's urban transport model assumes that, in a stable transport system, the supply of public transport is equal to the level of demand. COVID-19 and associated lockdowns resulted in a temporary break in this relationship.

However, because states maintained services for essential workers, services were likely sustained at rates similar to those captured by the regression.

- 53 Despite challenges to the validity of the supply proxy (passenger numbers by mode), a measure of supply is still needed to estimate transport expenditure. Models that capture demand but not supply are unable to accommodate the effects of congestion on operating costs.
- 54 The consultant's report for the 2020 Review identified that congestion was a significant driver of operating costs due to the impact of service disruptions and increased maintenance requirements. The report also noted that demand measures, including population density, did not capture the full costs associated with congestion.
- 55 While the available 2021–22 transport data suggest that public transport demand is still recovering, the Commission expects that demand will eventually reach a post-COVID-19 equilibrium, with states adjusting their supply to match.
- 56 Furthermore, the link between costs and the other factors captured by the model such as network complexity, topography and unique jurisdictional characteristics was not affected by the lockdowns.
- 57 The Commission's preliminary view is that the 2020 Review model for assessing urban transport needs remains appropriate. While the assumption that supply equals demand was challenged during the COVID-19 affected years, the Commission considers that this effect was temporary.
- 58 In the absence of COVID-19 lockdowns and restrictions, the Commission considers that the supply of urban transport will adjust to meet the new levels of ongoing demand. Therefore, the urban transport model remains robust and conceptually sound if used with fit for purpose data.

Consultation question

- Q1. Do states agree that the 2020 Review model for assessing urban transport needs remains appropriate?

Are reliable data available to update the assessment of urban transport needs?

- 59 COVID-19 has created a number of practical constraints for updating the model. This is because the data needed to update urban transport net expenses and passenger numbers were affected by the pandemic.
- 60 If available data are not fit for purpose, it may be necessary to delay updating the data used in the transport regression model. However, it may be possible to update the variables to which the regression coefficients apply if a reliable method can be

developed. A table showing data requirements for the model and the expected availability of fit-for-purpose data is included in Attachment A.

Updating data — regression

Dependent variable – net expense data

- 61 The 2020 Review regression model incorporates 3 years (2013–14 to 2015–16) of state-provided net urban transport expense data. Ordinarily, the Commission would request updated expense data in a review to ensure the assessment continues to reflect the most recently available data on state activities. However, the Commission is concerned that the available data might not reflect typical urban transport expenses.
- 62 Expense data from 2019–20 to 2021–22 are from a period when public transport use was lower than pre-COVID-19 levels. Lower fare collection means that the net expense data are likely to be overstated.
- 63 Data from 2022–23 are likely to be more reliable than data collected during the pandemic years. However, it is possible that public transport use and service provision are not yet in a new equilibrium following the COVID-19 experience. The 2023–24 financial year is likely to be the first full year of reliable data for all states. However, data for 2022–23 and 2023–24 are not likely to be available before the 2025 Review is finalised.
- 64 The Commission’s preliminary view is to retain the 2020 Review net expense data and associated regression coefficients until reliable expense data become available following the 2025 Review.

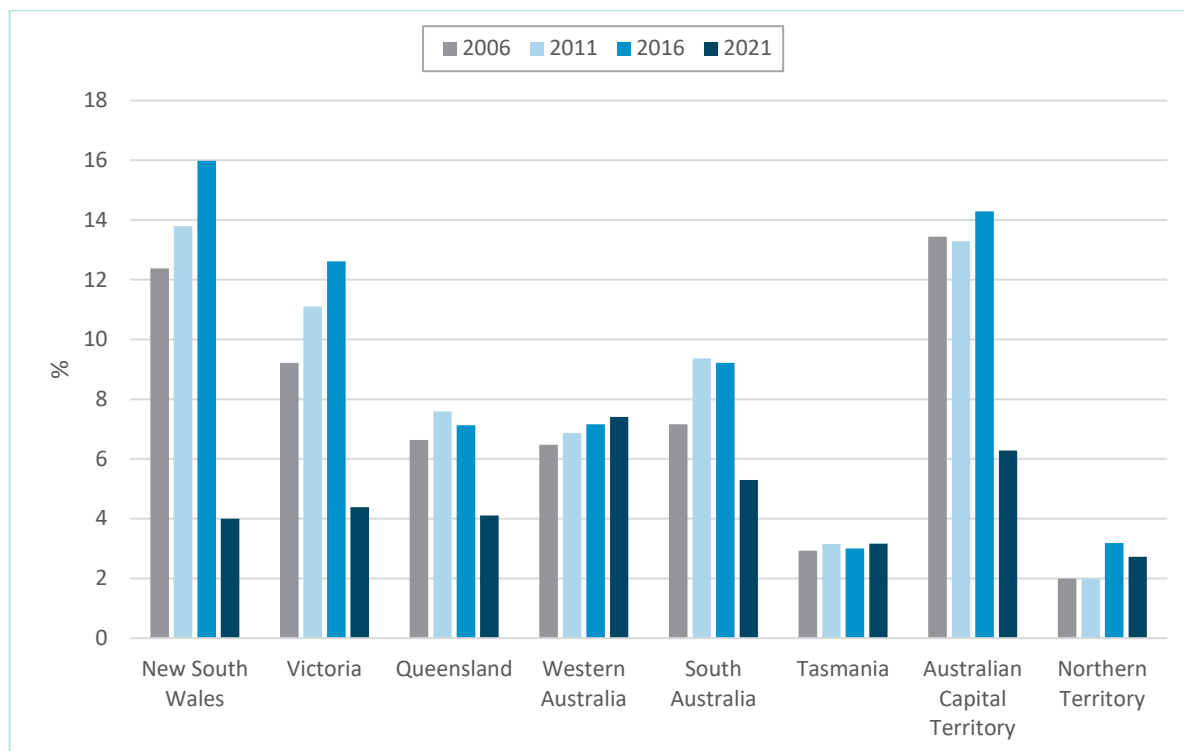
Consultation questions

- Q2. Do states consider the urban transport net expense data from 2019–20 to 2021–22 are likely to be overstated?
- Q3. If 2019–20 to 2021–22 data are not fit for purpose, do states support updating the regression with data from 2022–23? Can states provide an indication of when this data could be provided to the Commission? (See Attachment B).
- Q4. If 2022–23 data are considered fit for purpose but are not available for inclusion in the 2025 Review, do states support updating the assessment in an update following the 2025 Review?
- Q5. Do states support retaining the 2020 Review proxy variable data in the regression model until fit for purpose net expense data are available?

Independent variables

- 65 Data are available to reliably update the following independent variables:
 - population density (ABS population and geography)
 - average slope (Geoscience Australia)
 - the presence or absence of a ferry service.
- 66 The remaining variables, actual passenger numbers and distance travelled to work, are measured using ABS Census journey to work data.
- 67 The 2021 Census was conducted during a period of lockdowns and increased COVID-19 restrictions for New South Wales, Victoria, Queensland and the ACT.¹⁰
- 68 Compared with data from previous censuses, the 2021 Census data show a sharp reduction in the percentage of residents using public transport on Census Day, particularly in those states experiencing lockdowns (Figure 6). This coincided with a sharp increase in the percentage of state residents who did not work, or who were working from home (Figure 7).
- 69 The appropriateness of using 2021 Census data to update passenger numbers and distance to work is considered below.

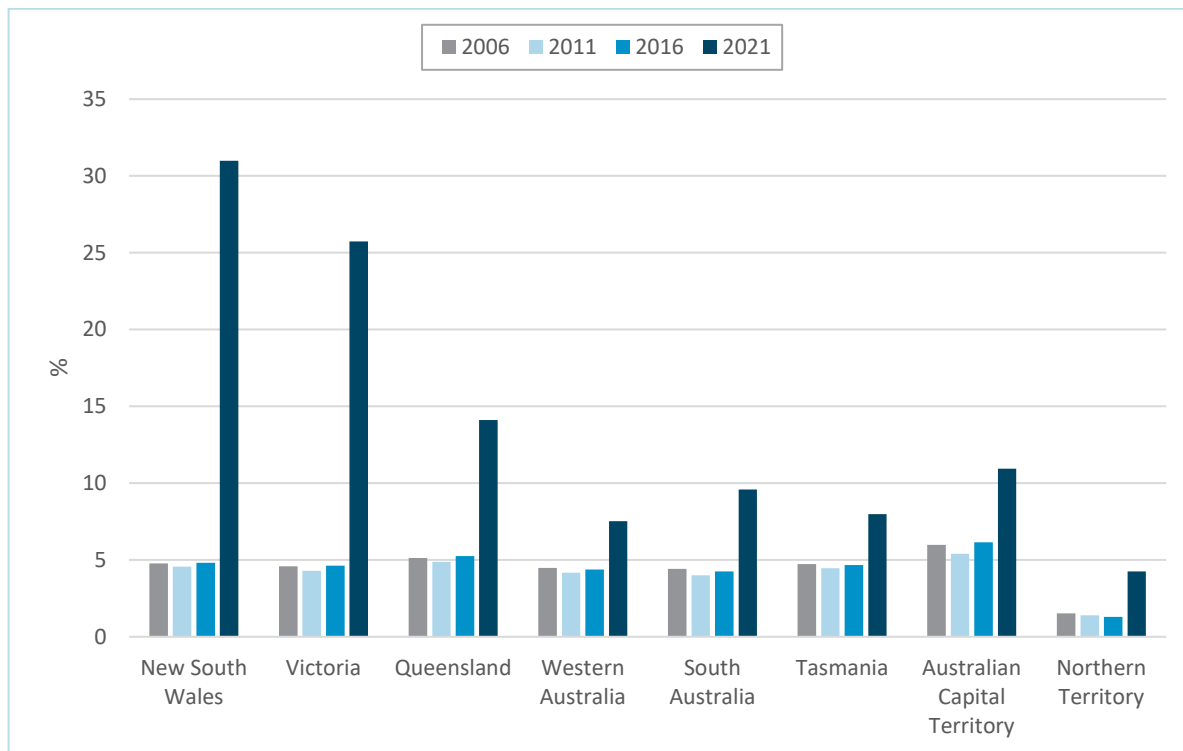
Figure 6 Percentage of state employed persons commuting via public transport, 2006 Census to 2021 Census



Note: Public transport is defined as the number of respondents who travelled to work by train, bus, ferry, or tram/light rail.
 Source: Commission calculation using ABS 2021 Census data.

¹⁰ On Census Day 2021, Sydney was nearly 50 days into its second lockdown, Melbourne was 5 days into its sixth lockdown and Brisbane was 2 days out of a 40-day lockdown. [ABS - Participation in the 2021 Census](#)

Figure 7 Percentage of state employed persons working from home, 2006 Census to 2021 Census



Source: Commission calculation using ABS 2021 Census data.

Actual passenger numbers

- 70 2016 Census journey to work data by urban area and mode are used in the regression model as a proxy for supply (actual passenger numbers by mode). They are also used to model passenger numbers to which the regression coefficients are applied (Figure 1). In the [2023 Update](#), the Commission concluded that there was sufficient evidence that 2021 Census data were distorted by the COVID-19 lockdowns and did not represent the level of service being provided at that time. Therefore, the data were not considered fit for purpose to model passenger numbers and 2016 Census data were retained.
- 71 For the same reasons, it would not be appropriate to use 2021 Census data to update actual passenger numbers in the regression model.
- 72 Compared with more direct measures of supply, such as state ticketing data, the Commission considers Census data are likely to be a more nationally consistent and policy neutral data source. Because there is no reason to believe that 2026 Census data will not be fit for purpose, there is a benefit to maintaining a model that uses Census passenger data.

- 73 The Commission’s preliminary view is that 2021 Census journey to work data are distorted by COVID-19 lockdowns and not fit for purpose to represent passenger numbers in the regression model. 2016 Census data will be used in the regression until 2026 Census data become available.
- 74 If state expense data become available before 2026 Census data are released, 2 options have been identified for adjusting 2016 Census data to capture changes in use and service provision over time. These options are considered below, from paragraph 87.

Consultation questions

When expense data are available to update the regression

- Q6. Do states agree that the 2021 Census journey to work data were distorted by the COVID-19 lockdowns and are not a fit for purpose measure of current passenger numbers?
- Q7. If the 2021 Census journey to work data are not fit for purpose, do states support the continued use of 2016 Census journey to work data in the model?

Distance to work

- 75 2016 Census distance to work data are used in the regression model as a proxy for network complexity.
- 76 Distance to work data from the 2021 Census indicate that the median distance to work increased slightly across most urban areas since the 2016 Census. Table 6 shows the changes in the median distance to work between Censuses.

Table 6 Median distance to work, kilometres

Capital cities	2016	2021
Sydney	10.5	10.5
Melbourne	11.5	11.5
Brisbane	10.5	11.5
Perth	11.5	12.5
Adelaide	9.5	9.5
Canberra	10.5	11.5
Hobart	8.5	8.5
Darwin	9.5	9.5

Source: ABS 2021 Census data.

- 77 As the magnitude of changes in the distance to work data is relatively small across most urban areas, the use of 2021 Census data does not cause a significant change in the GST distribution.
- 78 As with passenger numbers, it is likely that distance to work data collected during the census was impacted by COVID-19 lockdowns and associated health orders. However, the impact is not expected to be as extreme as for commuter data. This is

because the 2021 Census instructed respondents to list their ordinary place of work even if they were staying at home due to COVID-19.

- 79 The shift to working from home has continued beyond the pandemic, impacting patterns of transport demand. However, the same transport routes are still being used, just at a lower capacity. Thus, network complexity is likely to be relatively unaffected by this change.
- 80 The Commission's preliminary view is that the distance to work data from the 2021 Census were not significantly impacted by COVID-19 lockdowns and still provide a reliable measure of network complexity. Therefore, 2021 Census distance to work data should be applied when reliable net expense data are available to update the regression.

Consultation question

When expense data are available to update the regression

- Q8. Do states agree that 2021 Census distance travelled to work data were not significantly distorted by COVID-19 lockdowns and are a reliable measure of network complexity?

Updating data — variables applied to the regression coefficients

- 81 The fixed regression coefficients are applied to updated population density, modelled passenger numbers and updated transport modes (recognising new ferry services in urban areas) in each update.
- 82 Data are available to continue to reliably update the following variables:
- population density (ABS population and geography data)
 - introduction of ferry service (state data).
- 83 The data used to model passenger numbers (that is, 2016 Census journey to work data), are the same data used in the regression as a proxy for supply. The regression uses actual passenger numbers. However, to address concerns that passenger numbers can be influenced by policy decisions, such as concessions or service frequency, modelled passenger numbers are used to determine state transport needs.
- 84 As mentioned above, in the 2023 Update, the Commission determined that it was not appropriate to use 2021 Census data to model passenger numbers and 2016 Census data were retained.
- 85 There is no reason to believe that 2026 Census data will not be fit for purpose. However, the Commission is concerned that maintaining a measure of passenger numbers based on 2016 Census until 2026 Census data are available would fail to capture changes in passenger behaviour or the impact of expansions and additions to transport networks.

86 To maintain a model that continues to use census data and to ensure the model reflects current state circumstances, 2 options were identified for adjusting 2016 Census passenger numbers used to model passenger numbers.

Option 1: Use data from the Bureau of Infrastructure and Transport Research Economics to adjust 2016 Census passenger numbers

87 The Bureau of Infrastructure and Transport Research Economics provides annual data on passenger kilometres travelled by mode for capital cities. These data cannot be used directly to measure use in the assessment because they cannot capture supply changes outside of capital cities. However, they could be used to construct an index of changes in public transport use since 2016.¹¹ This index could be applied to the 2016 Census data.

88 Analysis of the 2016 Census data adjusted by changes in distance travelled is provided in Table 7. Using the adjusted data results in lower passenger numbers for all states compared with the 2016 Census data. However, the reduction in passenger numbers is much less than the 2021 Census figures, particularly for states that were in lockdown when the Census was conducted.

Option 2: Use state ticketing data to adjust 2016 Census passenger numbers

89 Alternatively, an index could be created using passenger numbers, rather than the distance travelled by all passengers. Ticketing data are publicly available for capital cities in all states except Tasmania and the Northern Territory.

90 An approach using ticketing data would allow for a more accurate representation of actual passenger numbers in capital cities, and the ability to account for non-commuter travel. However, it would be influenced by state ticketing policies, such as the Melbourne CBD free tram zone. Data from Tasmania and the Northern Territory would also be required.

91 Using ticketing data to adjust 2016 Census data results in adjusted passenger numbers similar to those calculated using Bureau of Infrastructure and Transport Research Economics distance travelled data (Table 7).

¹¹ All urban centres in a state would be indexed at the same rate as the capital city in that state.

Table 7 Urban transport passenger numbers using Bureau of Infrastructure and Transport Research Economics (BITRE) data and state ticketing data to adjust 2016 Census data compared with 2021 ABS Census data.

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
	'000	'000	'000	'000	'000	'000	'000	'000	'000
Heavy rail									
2016 Census passengers	462	297	82	70	16				927
BITRE-adjusted data (a)	223	132	50	48	10				463
2020-21 State ticket data (b)	273	110	52	54	11				500
2021 Census passengers	100	86	41	51	8				286
Bus and light rail									
2016 Census passengers	185	112	89	51	46	6	16	7	512
BITRE-adjusted data (a)	94	56	55	36	29	5	10	4	291
2020-21 State ticket data (b)	127	48	62	41	35	N/A	12	N/A	326
2021 Census passengers	40	45	45	38	33	6	11	2	222

(a) Data was adjusted to 2021–22 levels to be consistent with the 2021 Census data.

(b) Ticketing data was collected from state transport authorities. Data for 2021–22 was not available.

Source: Commission calculation using ABS Census data, ticketing data available from state transport agencies and BITRE data.

- 92 The Commission’s preliminary view is that 2016 Census data used to model passenger numbers would be indexed in each update using Bureau of Infrastructure and Transport Research Economics data until 2026 Census data are available. This is the preferred option because these data are more reliable and are comparable across states, and the adjustment results in a materially different GST distribution compared with using unadjusted 2016 Census data.¹²
- 93 If net expense data become available to update the regression prior to the 2026 Census journey to work data, the Commission will apply the same adjustment to actual passenger numbers. These will be replaced with 2026 Census data when they become available.
- 94 If an adjustment becomes immaterial, the Commission’s preliminary view is to continue using 2016 Census data without adjustment until Census 2026 data become available.

Consultation questions

When modelling passenger numbers to apply to regression coefficients

Q9. Do states agree that, if material, 2016 Census journey to work data should be adjusted using the Bureau of Infrastructure and Transport Research Economics measure of passenger kilometres travelled until the 2026 Census data are available?

When updating actual passenger numbers in the regression

Q10. Do states agree that if net expense data are available before the 2026 Census passenger numbers it is appropriate to use Bureau of Infrastructure and Transport Research Economics data to index actual passenger numbers?

¹² The largest increase in assessed GST needs is \$15 per capita and the largest decrease is \$8 per capita.

Blending

- 95 In the 2020 Review, the Commission decided to blend the assessment of urban centre characteristics with state share of urban populations by 75% and 25% respectively. The decision to blend was based on 2 main data related issues:
- concerns about the reliability of the net urban transport expense data provided by the states, which informed the regression model as the dependent variable.
 - for policy neutrality and data availability reasons, several proxy variables are used in the model to capture supply and demand.¹³
- 96 The Commission's preliminary view is to maintain this ratio because:
- it recognises that urban centre characteristics are the key driver of urban public transport need and reducing the impact of this driver would reduce the accuracy of the assessment.
 - changing the ratio would not address issues associated with retaining 2016 Census data in the assessment until 2026 Census data are available.

Consultation question

Q11. Do states support retaining the 2020 Review blending ratio for the urban transport assessment?

What are the implications of additions to networks and new modes of transport?

- 97 Transport networks evolve in response to changes in demand. States make decisions regarding the frequency with which services run, the routes these services take and whether networks extensions or additions are required. They also determine whether new modes of transport should be added.
- 98 In between review periods, the need for additional services is recognised in part by applying updated population density, modelled passenger numbers and the introduction of a ferry to the fixed regression coefficients. However, maintaining the coefficients from the estimated regression model means that the full impact of these changes is not reflected in the costs for urban cities until the regression is updated with new net expense and passenger numbers.
- 99 As discussed from paragraph 59, reliable net expense data and passenger number data may not be available for inclusion in the 2025 Review. In the absence of alternative reliable and nationally comparable data, the Commission's preliminary view is to wait until reliable data are available to update the regression coefficients.
- 100 The current model can accommodate the addition of a ferry to transport service mix in an urban area. This is because passenger numbers are not considered for ferry

¹³ The Commonwealth Grants Commission, [2020 Review, Final Report, Volume 2, part B, Chapter 21 – Transport](#), 30 March 2020.

services, but rather whether a city has a ferry or not.¹⁴ A limitation of the current model is that all urban areas with ferry services are assumed to require the same level of service per capita, regardless of use or complexity of the service. Therefore, all urban areas with ferries are estimated to spend the same amount per capita on ferries.

- 101 The introduction of a ferry service in Hobart in 2021 has prompted the Commission to reconsider the appropriateness of this approach.
- 102 The ferry service in Hobart consists of one ferry with a capacity of up to 535 passengers, running between 2 stops 8 times a day. In contrast the Sydney ferry network consists of over 30 ferries, covering 10 routes across 38 wharves.
- 103 The Commission acknowledges that ferry services are not comparable between urban areas. As noted in the 2020 Review, an alternative method based on passenger numbers (as used for heavy rail, light rail and buses) is not appropriate. This is because the scale of a ferry service is linked to the geographical features of an urban area, not just demand for public transport services.
- 104 In addition, the consultant determined that a specific measure based on the number of ferry vessels or wharves was not appropriate given the limited number of observations available to inform the regression. Issues with this measure would be exacerbated because the data would exclude Brisbane ferries as these are provided by the city council.
- 105 The Commission re-examined a model based on the proportion of total commuters using ferry services instead of the ferry dummy variable (see Attachment A for more information).
- 106 The proportions of ferry passengers were calculated using 2016 Census commuter numbers by transport mode. As the ferry network did not exist in Hobart in 2016, 2021 Census commuter proportions were used. While COVID-19 health safety measures were in place on Census Day in Hobart, it was not in lockdown. In addition, the proportions of commuters travelling by public transport are less affected by COVID-19 than actual passenger numbers. Until 2026 Census data are available, the Commission considers that 2021 Census data for Hobart are fit-for-purpose.
- 107 The Commission's preliminary view is to assess urban ferry costs based on the proportion of commuters using ferry services. The Commission considers that this represents an improvement over the current approach because it can account for differences in the scale of ferry networks.

¹⁴ In the 2020 Review, it was determined that the scale of ferry usage is not necessarily related to the overall level of transport demand in an urban centre. For this reason, a dummy variable is used to indicate the presence or absence of this service rather than passenger numbers.

Consultation question

Q12. Do states support replacing the ferry dummy variable in the urban transport model with the proportion of total commuters using ferry services?

What are the implications of changes to urban centre sizes and populations?

- 108 The urban areas used in the Commission's assessment of urban transport expenditure are based on the Australian Statistical Geography Standard produced by the ABS.
- 109 The topography variable in the regression (that is, mean land slope from Geoscience Australia) is based on the 2016 Census urban areas classification and will not be updated until reliable net expense data are available.
- 110 Changes in the boundaries of significant urban areas are updated every 5 years as the Census data are released. These changes are captured in the Commission's measure of population density and modelled passenger numbers that are applied to the fixed regression coefficients and used to determine satellite cities.¹⁵
- 111 As urban areas grow, it is important to ensure the method used for modelling passenger numbers remains suitable.

Modelling passenger numbers

- 112 In the 2020 Review method, average passenger numbers are calculated for all urban areas within a population range, with or without heavy rail. The method reflects analysis showing that public transport use is related to the size of urban centre populations and the availability of heavy rail services. There are 6 population ranges to group urban areas with similar transport needs and challenges.
- 113 Table 8 shows the population ranges in the 2020 Review.

Table 8 Population ranges used to group significant urban areas

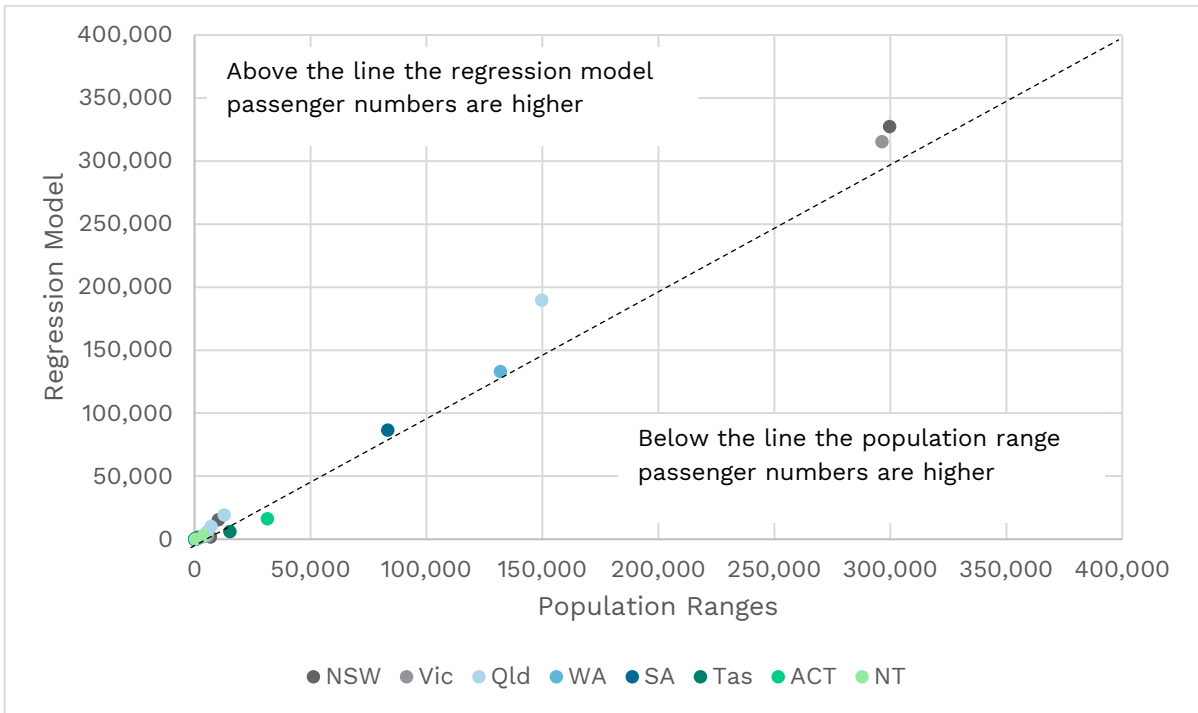
Lower limit	Upper limit	Number of urban areas (no heavy rail)	Number of urban areas (heavy rail)
0	50,000	75	0
50,001	100,000	11	0
100,001	200,000	4	0
200,001	1,000,000	2	6
1,000,001	2,500,000	0	3
2,500,001	5,000,000	0	2

Source: 2020 Review.

¹⁵ A satellite city is an urban area that has a sufficiently integrated labour market with a neighbouring larger urban area. These cities are included in the larger urban area.

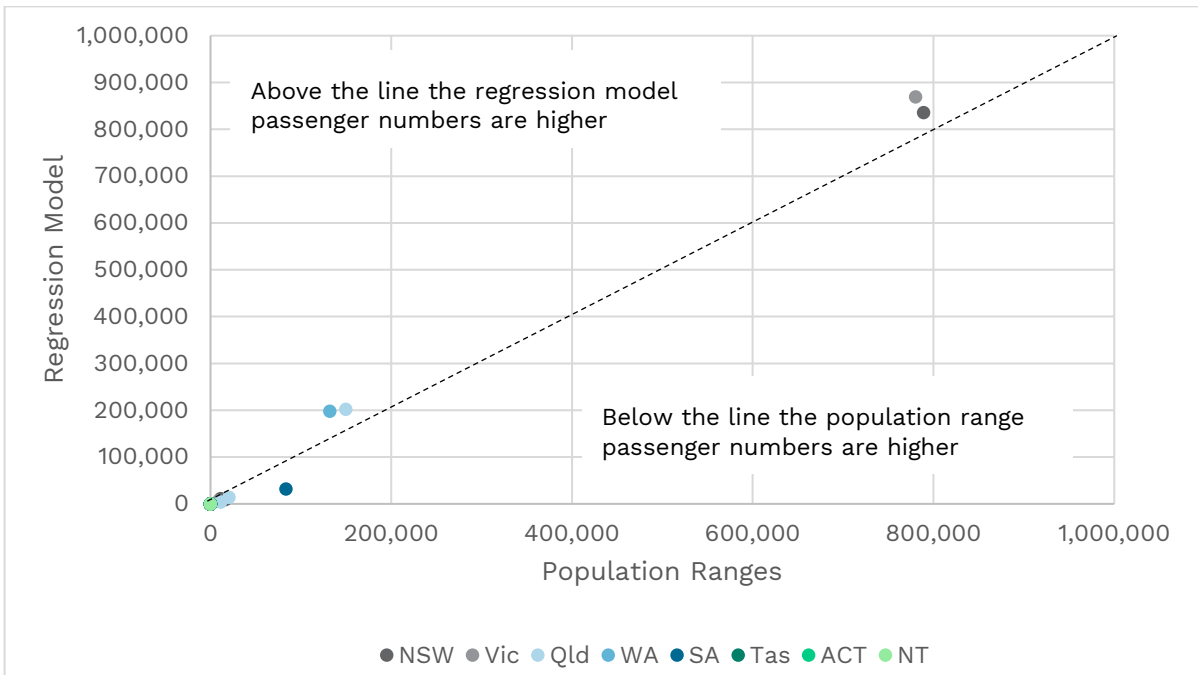
- 114 Since the 2020 Review, the populations of Sydney and Melbourne have grown and are close to exceeding 5 million (the top of the largest population range). Brisbane is on track to exceed 2.5 million, moving it into the largest population range. If thresholds are not adjusted, Brisbane would be assessed to have similar needs to Sydney and Melbourne, cities with significantly larger networks and higher public transport use.
- 115 The Commission investigated changing the thresholds of the top ranges to reflect the growth of urban centres. One option is to adjust the scope of the 2 largest ranges. The upper limit of 2.5 million could increase to 3 million, and the largest city group could increase from 2.5 million to 3 million plus. These changes would ensure urban areas with similar transport needs are grouped together and there are at least 2 cities in each range to maintain policy neutrality.
- 116 However, a model based on fixed ranges is unable to account for the variation of transport needs that can exist between an urban area that is close to the lower limit of the population range and an urban area that is close to the upper limit. In addition, small differences in populations, for instance between 49,000 and 51,000, can result in urban areas with similar transport needs being assessed very differently.
- 117 To address this issue, a regression approach has been identified based on the effect of percentage changes in population on the percentage change in passenger numbers, with an adjustment for urban areas with heavy rail services. It recognises that passenger numbers steadily increase as the size of a city grows.
- 118 Compared with the approach used to model passenger numbers based on population ranges, the regression approach does not result in a large change in passenger numbers.
- 119 This can be seen in Figure 8 and Figure 9 which show the modelled passenger numbers resulting from the current approach that uses population ranges, and the modelled passengers that uses the regression approach.
- 120 For both bus and light rail passengers and heavy rail passengers, the regression approach produces slightly higher modelled passenger numbers (as the points are above the dotted line) while remaining close to the dotted line.

Figure 8 Modelled bus and light rail passengers under the population range and regression approaches



Source: Commission calculation.

Figure 9 Modelled heavy rail passengers under the population range and regression approaches



Source: Commission calculation.

121 To future-proof the assessment and to capture changes in population on a continuous basis, the Commission’s preliminary view is to adopt the regression approach to model passenger numbers for the 2025 Review.

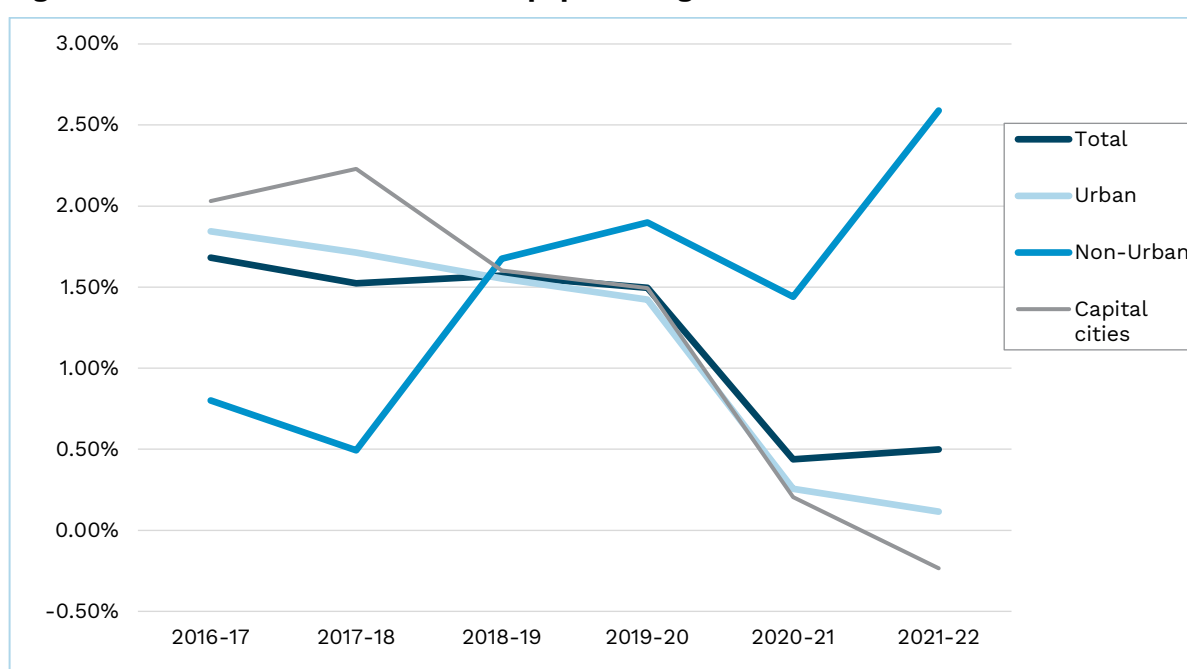
Consultation question

Q13. Do states agree that using a regression model to recognise the growth in passenger numbers in urban areas is a more suitable method for modelling passenger numbers?

What are the implications of changing non-urban populations?

122 Figure 10 shows the change in population growth from 2016–17 to 2021–22. It shows that during this time there has been a movement out of urban areas towards non-urban areas. This pattern was exaggerated in the years affected by COVID-19.

Figure 10 Urban vs non-urban annual population growth



Source: ABS data.

123 Data for 2022–23 populations by fine level geography are not yet available. However, ABS population data for September 2022 indicated that the large population shift away from capital cities during the years affected by COVID-19 was largely temporary with growth rates returning to pre-COVID-19 trends.¹⁶

124 The observed patterns of population growth prompted the Commission to investigate whether an equal per capita assessment of non-urban transport expenses remains appropriate.

125 Table 9 shows a breakdown of non-urban transport recurrent net expenses in 2020–21. It indicates that most expenses relate to heavy rail passenger services in New South Wales, Victoria and Queensland.

¹⁶ABS, September 2022, National, state and territory population,

Table 9 Non-Urban Transport Net Expenses 2020-21

	NSW	Vic (a)	QLD	WA	SA	TAS	NT	Total	Share of total
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	%
Passenger rail	135	854	447	16	0	0	0	1,415	81
Bus	0	0	93	33	7	0	0	143	8
Freight rail	6	0	74	13	0	11	0	109	6
Water transport (b)	-1	25	-47	49	3	3	1	47	3
Air transport	15	0	0	2	0	10	3	38	2
Total	155	879	567	114	9	25	4	1,752	100

(a) V-line expenses are included in Victoria's passenger rail data.

(b) Includes non-urban water transport and urban freight water transport.

Note: The ACT does not have a non-urban transport network.

Source: Commission calculation using recurrent adjusted ABS Government Finance Statistics data.

126 To understand the needs associated with passenger rail services, the Commission used 2016 Census journey to work data to investigate the commuter use patterns of non-urban passenger rail services.¹⁷ These data indicate that most of the use on non-urban rail passenger services is by people in urban centres commuting to non-urban areas or between urban areas.¹⁸

127 The Commission recognises that the 2016 Census data used to undertake this analysis may not fully reflect current service use patterns, particularly in light of the observed population growth patterns since 2016. Nor does it reflect any changes in service provision that may have occurred since 2016. However, the Commission considers that, due to the fixed nature of non-urban rail networks and therefore access to services, the 2016 Census data are likely to provide a good estimate of service use until 2026 Census data are available.

128 The Commission considered an assessment of non-urban passenger rail expenses based on non-urban passenger rail commuter data (including those residing in urban and non-urban areas), see Table 10.

Table 10 Non-urban train commuters by state¹⁹

	NSW	Vic	QLD	WA	SA	TAS	NT	Total
	'000	'000	'000	'000	'000	'000	'000	'000
Non-urban train commuters	16.1	11.8	4.6	0.8	0.3	0.01	0.004	33.7
	%	%	%	%	%	%	%	%
Percentage of total non-urban train commuters	48.1	34.9	13.8	2.2	0.8	0.03	0.01	100

Source: Commission calculation based on ABS 2016 Census data.

129 The primary reason for the interstate pattern shown in Table 10 is the presence of large populations commuting from other urban centres to capital cities. The main

¹⁷ See paragraphs 70 and 71 for an explanation why 2021 Census journey to work data are not considered fit for purpose.

¹⁸ Urban transport is defined as transport within an urban area. Transport between urban areas is considered non-urban transport.

¹⁹ ABS 2016 Census TableBuilder data was used to obtain disaggregated commuter numbers. All commuters who travelled within the same urban area were removed, as these passengers are captured in the urban transport component.

centres are Central Coast and Wollongong in New South Wales, Geelong in Victoria and the Gold Coast and Sunshine Coast in Queensland. Other states do not have large urban centres within commuting distance of their capital cities.

- 130 The policy neutrality of such a measure was considered. The number of non-urban passenger rail commuters was determined to be driven primarily by non-policy factors including:
- geographic factors such as the distance between urban fringes, density of the destination city, the existing road and rail network and lifestyle factors.
 - economic factors such as industry mix, wage differences and housing costs.
- 131 While policy differences, such as in train timetable frequency, fares, toll prices and road quality, may have some impact on passenger numbers, the non-policy factors appear to be the dominant drivers. The Commission considers that the policy influences are relatively minor.
- 132 When applied to 80% of non-urban transport expenditure an assessment based on non-urban rail commuters results in a material difference in GST distribution, the largest increase in distribution was \$31 per capita and the largest decrease was \$71 per capita.
- 133 The Commission's preliminary view is to assess non-urban passenger rail expenses using a measure based on non-urban train commuters as recorded in the 2016 Census. The data will be updated with 2026 Census data when available. The remaining expenses will be assessed based on populations in non-urban areas because the majority of these services are used by populations in non-urban areas.

Consultation question

- Q14. Do states support the following changes to the non-urban transport assessment:
- assessing non-urban rail passenger expenses based on shares of non-urban train commuters?
 - assessing all remaining expenses based on shares of non-urban populations?

Proposed assessment

Differences from the 2020 Review approach

- 134 Subject to state views, the Commission proposes the following changes from the 2020 Review approach:
- use Bureau of Infrastructure and Transport Research Economics data on kilometres travelled to index Census 2016 journey to work data used to model passenger numbers if it remains material in the 2025 Review
 - update the data used in the regression model following the 2025 Review when state net expense data are available

- use a regression approach to model passenger numbers
- use proportion of total commuters using ferry services to capture ferry costs
- use data on non-urban passenger rail commuters to assess expenditure for non-urban passenger rail services with the remaining non-urban transport expenses assessed based on non-urban population share.

Proposed assessment structure

135 Table 11 shows the proposed structure of the transport assessment for the 2025 Review.

Table 11 Proposed structure for the transport assessment

Component	Driver	Influence measured by driver	Change since 2020 Review?
Urban transport	Urban centre characteristics (a)	Recognises that the use and cost of services varies by population-weighted density, use and presence of a public transport mode, distance to work and topography	Yes
	Urban population	Recognises that urban transport services vary by the share of the state population living in urban areas	No
	Wage costs (b)	Recognises differences in wage costs between states	No
Non-urban transport	Non -urban rail commuter numbers	Recognises differences in use of non-urban passenger rail services between states	Yes
	Non-urban population	Recognises that non-urban transport services, other than passenger rail, vary by the share of the state population living in urban areas.	Yes
	Wage costs and regional costs (b)	Recognises differences in wage costs between states and in the costs of providing services to different areas within a state	No

(a) The Commission proposes to update the inputs into urban centre characteristics model when reliable data are available. The Commission also proposes to use a regression to determine a policy neutral estimate of public transport users in each state.

(b) The Commission will separately consult with states on the wages and regional costs assessment.

Source: Commission calculation.

New data requirements

136 Data to update the regression will be required. This includes:

- urban transport net expense data (general government and public non-financial corporation) from the states (see Attachment B).
- data on urban area topography will be requested from Geoscience Australia to update the urban transport regression.

137 Information on the timing of state data requests will be provided in July 2023 (see Attachment B).

138 If reliable net expense data from all states are received by June 2024, they may be able to be reflected in the 2025 Review.

Consultation

- 139 The Commission welcomes state views on the consultation questions identified in this paper (outlined below) and the proposed assessment. State submissions should accord with the 2025 Review framework. States are welcome to raise other relevant issues with the Commission.

To what extent has the experience of COVID-19 challenged the underlying assumptions of the urban transport assessment?

- Q1. Do states agree that the 2020 Review model for assessing urban transport needs remains appropriate?

Are reliable data available to update the assessment of urban transport needs?

- Q2. Do states consider the urban transport net expense data from 2019–20 to 2021–22 are likely to be overstated?
- Q3. If 2019–20 to 2021–22 data are not fit for purpose, do states support updating the regression with data from 2022–23? Can states provide an indication of when this data could be provided to the Commission? (See Attachment B).
- Q4. If 2022–23 data are considered fit for purpose but are not available for inclusion in the 2025 Review, do states support updating the assessment in an update following the 2025 Review?
- Q5. Do states support retaining the 2020 Review proxy variable data in the regression model until fit for purpose net expense data are available?

When expense data are available to update the regression

- Q6. Do states agree that the 2021 Census journey to work data were distorted by the COVID-19 lockdowns and are not a fit for purpose measure of current passenger numbers?
- Q7. If the 2021 Census journey to work data are not fit for purpose, do states support the continued use of 2016 Census journey to work data in the model?
- Q8. Do states agree that 2021 Census distance travelled to work data were not significantly distorted by COVID-19 lockdowns and are a reliable measure of network complexity?

When modelling passenger numbers to apply to regression coefficients

- Q9. Do states agree that, if material, 2016 Census journey to work data should be adjusted using the Bureau of Infrastructure and Transport Research Economics measure of passenger kilometres travelled until the 2026 Census data are available.

When updating actual passenger numbers in the regression

Q10. Do states agree that if net expense data are available before the 2026 Census passenger numbers it is appropriate to use Bureau of Infrastructure and Transport Research Economics data to index actual passenger numbers?

Q11. Do states support retaining the 2020 Review blending ratio for the urban transport assessment.

What are the implications of additions to networks and new modes of transport?

Q12. Do states support replacing the ferry dummy variable in the urban transport model with the proportion of total commuters using ferry services?

What are the implications of changes to urban centre sizes and populations?

Q13. Do states agree that using a regression model to recognise the growth in passenger numbers in urban areas is a more suitable method for modelling passenger numbers?

What are the implications of changing non-urban populations?

Q14. Do states support the following changes to the non-urban transport assessment:

- assessing non-urban rail passenger expenses based on shares of non-urban train commuters?
- assessing all remaining expenses based on shares of non-urban populations?

Attachment A: Technical note

Regression — urban centre characteristics

140 In the 2020 Review the Commission engaged a consultant, Jacobs and Synergies economic consulting, to identify a measure of urban transport needs. The model proposed by the consultant and adopted by the Commission identifies the effect on urban centre characteristics on the level of net per capita expenditure.

141 The model of urban transport characteristics is specified below.

$$exp_i = \beta_0 + \beta_1 dense_i + \beta_2 dist_i + \beta_3 slope_i + \beta_4 \ln(pax_{i,train}) + \beta_5 \ln(pax_{i,bus+light\ rail}) + \beta_6 D_{i,ferry}$$

142 Where exp_i is net per capita state expenses on public transport by urban centres.

- Population weighted density ($dense_i$) is a proxy used to represent demand for public transport. It is calculated as the sum of density of each Statistical Area Level 1 (SA1) in all urban centres and localities (UCL) within a Significant Urban Area (SUA) weighted by the SA1 population share of the UCLs in the SUA.
- Median commuter distance to work ($dist_i$) is a proxy representing network complexity. It is derived using 2016 Census data on the distance travelled (shortest path of the road network) between an individual's usual residence and place of work.
- Mean land slope ($slope_i$) represents the topography of urban centres, as measured by the average mean slope of the urban areas. The data was generated from a spatial analysis process developed by Geoscience Australia.
- The logarithm of passenger numbers by public transport mode ($pax_{i,train}$ and $pax_{i,bus+light\ rail}$) is a proxy which accounts for the supply of public transport and congestion. Heavy rail passengers are considered separately from bus and light rail passengers. These data are derived using 2016 Census method of travel to work data.
- Dummy variable is included to control for the presence or absence of ferry services as a mode of transport ($D_{i,ferry}$).

Measure of urban areas

143 The Australian Bureau of Statistics (ABS) definition of an urban centre, Urban centres and localities (UCLs) contained within Significant Urban Areas (SUAs), is used to define urban areas for the purposes of the transport assessment.

144 The Commission defines urban areas that have a highly integrated labour market with a neighbouring capital city as satellite cities. These cities are included as a part of the larger urban area in our calculations.

145 An SUA is considered a satellite to a capital city if:

- it has a relatively high outside SUA dependency index value (that is, a high proportion of people working outside the SUA)
- it has a relatively high dependency to the capital city index value (that is, a high proportion of people working within the capital city SUA).

Actual and modelled urban passenger numbers

- 146 The passenger variables used in the regression model of urban centre characteristics are based on ABS Census data on the modes of transport used by commuters. These actual passenger numbers from the Census are used to calculate the estimated regression coefficients.
- 147 However, when applying the variables to the regression coefficients the Commission uses modelled passenger numbers. This is necessary to account for the use of public transport for reasons other than work, such as recreational and school travel. It also removes the effect of policy choices on passenger numbers.
- 148 In the 2020 Review, the approach allocated urban areas to groups based on population ranges and the presence or absence of heavy rail. The average use of heavy rail, bus or light rail as a proportion of total commuters for urban areas in each population range was calculated. The average use rate is then multiplied by the total population in each urban area to obtain a measure of modelled passenger numbers.
- 149 Multiplying by total population results in higher modelled passenger numbers across all urban areas to account for non-work travel. The use of average rates for each population range also removes the effect of policy choices in individual urban areas.

Data requirements

Table A1 Required data to update the urban transport model

Data	Data provider	Held constant	Updated yearly	COVID-19	Next available data	When it could be updated in model
Urban transport regression						
Net expenses on public transport by urban area and mode	States	✓	✗	✓	2022-23	R2025 or U2026
Actual transport passenger numbers (supply)	ABS	✓	✗	✓	2026 Census	U2028
Population weighted density		✓	✗			
Urban area population	ABS	✓	✗	✗	Yearly ERP	*
Urban area size	ABS	✓	✗	✗	2021 Census	*
Distance to work (network complexity)	ABS	✓	✗	✗	2021 Census	*
Slope of area (topography)	Geoscience	✓	✗	✗	Available for all years	*
Variables applied to coefficients						
Modelled passenger numbers		✗	✓			
Actual passenger numbers	ABS	✓	✗	✓	2026 Census	U2028
Urban area population	ABS	✗	✓	✗	Yearly ERP	Yearly
Population weighted density		✗	✓			
Urban area size	ABS	✓	✗	✗	2021 Census	U2024
Urban area population	ABS	✗	✓	✗	Yearly ERP	Yearly
The addition of a ferry (public transport modes)	States	✗	✓	✗	Yearly	Yearly

* data can only be updated when net expense data are updated.

Source: The Commission.

Alternative measure of ferry services

150 To model differences in the scale and availability of ferry services the ferry dummy can be replaced by a variable measuring the proportion of public transport commuters in each urban area which use ferry services.

$$exp_i = \beta_0 + \beta_1 dense_i + \beta_2 dist_i + \beta_3 slope_i + \beta_4 \ln(pax_{i,train}) + \beta_5 \ln(pax_{i,bus+light\ rail}) + \beta_6 proportion_{i,ferry}$$

151 To identify the impacts on the GST distribution of using modelled ferry passengers the regression model was re-run. The model using ferry proportions was compared with the ferry dummy variable model with updated coefficients to account for the introduction of Hobart's ferry service. The estimated coefficients from the model are included in Table A2.

Table A2 Estimated coefficients, ferry commuter percentage model compared with ferry dummy model

Variable	Coefficients (ferry commuter model)	Coefficients (ferry dummy model)
Intercept	-127.621	-128.112
Ferry proportions	4.261	
Ferry dummy		9.529
Heavy rail passengers	12.729	12.485
Bus and light rail passengers	5.169	5.434
Population weighted density	0.086	0.086
Mean slope	6.478	6.601
Distance to work	3.062	3.071

Source: Commission calculation.

Attachment B: Indicative data required from states to update the urban transport assessment in the 2025 Review

Recurrent expenditure and revenue

- 152 Data relating to all significant urban areas (SUAs) where the state government either directly or through a public non-financial corporation (PNFC) contribute financially to urban transport provision are required.
- 153 Where states provide integrated urban transport services across their capital and main satellite cities, data will need to be disaggregated to at least the SUA level even if the disaggregation is approximate. To split the different urban areas, our preferred approach is to use revenue kilometres travelled (or any other measure of activities, such as journey kilometres or patronage) within the urban area to determine the split.

Table B1 General government sector (GGS) recurrent expenditure and revenue

Complete one table per significant urban area	Name of urban area
	2022-23
Total revenue (\$m)	
Fare revenue (\$m)	
Dividends received from PNFCs (\$m)	
Other payments received from PNFCs (\$m)	
Other revenue – please describe (\$m)	
Total operating expense (\$m)	
Concession subsidies (\$m)	
<i>Direct service provision by GGS (\$m)</i>	
<i>Paid to PNFCs (\$m)</i>	
<i>Paid to others (\$m)</i>	
Other subsidies if service not directly provided by GGS	
<i>Paid to PNFCs (\$m)</i>	
<i>Paid to others (\$m)</i>	
Other expenses – please describe (\$m)	
<i>Depreciation if service provided directly by GGS (\$m) (a)</i>	

Note: Fare revenue should exclude fare box revenue collected on behalf of private providers.

Subsidies paid refer to those provided to private providers and local governments.

- (a) This should only include depreciation expenses on assets directly used in service delivery. It should exclude head office related depreciation.

Table B2 PNFC recurrent expenditure and revenue

Complete one table per significant urban area	Name of urban area
	2022-23
Total revenue (\$m)	
Fare revenue (\$m)	
Concession subsidies from GGS (\$m)	
Other subsidies from GGS (\$m)	
Other revenue – please describe (\$m)	
Total expense (\$m)	
Subsidies paid (\$m)	
<i>Concession subsidies (\$m)</i>	
<i>Other subsidies (\$m)</i>	
Payments to GGS (\$m)	
<i>Dividends (\$m)</i>	
<i>Other payments (\$m)</i>	
Other expenses – please describe (\$m)	
<i>Depreciation if service provided by PNFC (\$m) (a)</i>	

Note: Fare revenue should exclude fare box revenue collected on behalf of private providers.

Subsidies paid refer to those provided to private providers and local governments.

- (b) This should only include depreciation expenses on assets directly used in service delivery. It should exclude head office related depreciation.