Transport

Review outcomes

- The following changes were made to the assessment.
  - The regression will be re–estimated using 2022–23 state-provided net expense data to ensure the assessment remains contemporaneous and reflects post-COVID-19 urban transport provision.
  - Population-weighted density will be measured using a square kilometre grid, rather than Statistical Areas Level 1 (SA1) areas, to provide a more consistent and less volatile measure of density.
  - The passenger numbers applied to the regression will be modelled using a regression to account for differences in public transport use rates as cities grow rather than average passenger numbers for all urban areas of similar sizes.
  - A temporary 10 percentage point increase will be applied to the urban population driver (from 25% to 35%) in the blended recurrent urban transport assessment. This recognises data issues arising from COVID-19. Once fit-for-purpose 2026 Census data become available in 2027, the blending ratio will return in the 2028 Update to 75% from the regression model estimates and 25% urban populations.
  - A larger proportion of V/Line expenses will be allocated to urban transport to better reflect Victorian service provision.
  - Pipeline transport expenses will be allocated to the non-urban transport component as they mostly relate to non-urban areas.
- The Commission considered but did not change the following.
  - The urban transport regression model will be retained although some changes (noted above) will be made to improve the measurement and application of selected variables.
  - 2021 Census data will continue to be used to measure the distance to work variable because the ABS made adjustments to mitigate the impact of COVID-19 on the data.
  - A dummy variable will continue to be used to assess ferry transport services. State needs for ferry services in an urban area will not be based on the proportion of commuters using ferry services because this approach produced implausible results and may be subject to policy influence. Ferry expenses will not be assessed equal per capita because the need for ferry services is not consistent across states.
  - There will be no further increase to the weighting of the urban population driver in the blended recurrent urban transport assessment and no discount will be applied in the urban transport investment assessment.
  - Non–urban expenses will continue to be assessed equal per capita as these services are provided for the use of populations within and outside of urban areas.

- Remoteness and non-commuter group variables will not be included as explanatory variables in the urban transport regression model. Some were negatively correlated with expenses and others had significant data limitations.
- Modelled passenger numbers will not be based on population-weighted density. Population-weighted density is already present in the regression so using it to model passenger numbers would be double counting.
- State shares of urban population squared will be retained in the blended urban transport investment assessment.
- The blending ratio for the urban transport investment assessment will remain the same. This reflects that there are not the same data concerns arising from the impact of COVID-19 as for recurrent spending.
- Non-urban school transport will remain in the urban transport component. This reflects issues with separating urban and non-urban school transport expenses.

Introduction

1 On 6 July 2024, the Commission published the Draft Report for the 2025 Methodology Review.

2 The Draft Report included a detailed analysis and response to issues raised by states and territories (states) in their submissions on the Commission's consultation paper.

3 State submissions on the Draft Report can be viewed here.

4 On 5 August 2024, an addendum to the transport chapter of the Draft Report was published on the Commission's website.

5 This chapter includes:

- an overview of the issues considered throughout the review
- the Commission's response and decision on each issue
- GST impacts of method changes.

6 A description of the transport assessment method, incorporating the changes made in the 2025 Review, can be found in the transport chapter of the *Commission's Assessment Methodology*.

Issues considered

Urban centre characteristics model

7 The Commission sought state views on whether the urban centre characteristics regression model (blended with state shares of urban populations) remained

appropriate to assess urban transport needs, given the impact of COVID-19 on transport provision and use.

State views

8 While most states broadly supported the continued use of the urban centre characteristics regression model, there were some concerns.

9 Queensland did not support the use of the regression model, citing concerns with the variables in the regression including the inability to account for non-commuter use. It also raised concerns about the impact of state policy decisions on the model. Queensland said the model had conceptual and practical issues that could not be addressed through re-estimation of the model.

10 Queensland suggested that the model be replaced with an assessment based on urban population shares and concession card holders, as these drivers would not be subject to the policy contamination and reliability issues of the urban transport model. It also suggested school transport be removed from the component and separately assessed.

11 Western Australia questioned why controls for remoteness are not included in the urban centre characteristics model and requested results of the analysis using the updated state net expense data. Western Australia noted that other insignificant variables (such as slope and the ferry dummy) are included in the model.

12 Tasmania supported the proposal to retain the urban centre characteristics regression model but had concerns about the continued use of population-weighted density in the regression. It recommended including additional variables to account for non-commuter use.

Commission response

13 The Commission considers that the regression model remains the best approach to reflect the diverse needs of state transport systems. With the improvements identified in the 2025 Review, the model is more reflective of state needs than an assessment based on urban population and concession shares alone. The use of urban population shares would assume an equal per person cost for people living in different urban areas, which does not reflect what states do. The use of concession card holders would over-estimate the public transport need for smaller urban areas.

14 The Commission tested alternative models, including variables to account for different non-commuter groups (see Appendix A). However, these models resulted in implausible results with negative coefficients for some non-commuter users. [1] This occurs because areas with high numbers of non-commuter passengers have relatively lower per capita costs. The Commission also tested models incorporating

[1] Results of testing have been updated to account for revisions to 2022-23 significant urban area populations. The results provided in Appendix 1 cannot be directly compared to those available in the transport addendum.

remoteness. These also had implausible results, with negative coefficients for all regional dummies (see Appendix A).[2] The inner regional dummy was also negative, as inner regional urban areas spend less per capita than major cities.

15 While noting concerns about the inclusion of population-weighted density in the regression, the Commission considers that any urban transport model needs to account for the higher costs of complex transport networks in more dense areas.

16 Recognising the extent of unease some states had with the urban transport model, following the Review the Commission will seek external advice on its approach for assessing urban transport spending. Most states supported such a review. However, New South Wales considered the 2020 Review assessment method was robust, that the Commission had addressed concerns raised by other states, and as such it was not obvious urban transport required further attention between reviews. Victoria said re-examining the urban transport assessment before the next review would be impractical due to the relevant data not being available. It considered that work on other issues should be prioritised over urban transport in the forward work program.

17 More detail on this issue can be found in the forward work program chapter of *Review Outcomes*.

Commission decision

18 The Commission will continue to use the urban characteristics regression model, retaining the current variables and incorporating identified improvements to their measurement and application. The regression model will continue to be blended with state shares of urban populations.

19 The Commission will not add variables to account for remoteness or non-commuter users.

Re-estimation of the urban transport regression

20 To ensure the model reflects post-COVID-19 transport provision and remains contemporaneous, the Commission sought state views on the appropriateness of updating the urban transport regression model with 2022–23 state net expense data. To improve the reliability of the assessment, the Commission proposed updating the regression with an additional year of data (2023–24) in the 2026 Update, once it becomes available.

[2] Significant Urban Areas were assigned to remoteness categories based on the Australian Bureau of Statistics remoteness areas classifications. These categories included major cities, inner regional, outer regional remote of very remote areas. Australian Bureau of Statistics (ABS), *Australian Statistical Geography Standard (ASGS) Edition 3* [Remoteness Areas], ABS website, 2023, accessed 5 February 2025.

State views

21 Most states that responded supported updating the regression model with more recent net expense data.

22 New South Wales supported updating the regression model but raised concerns that 2022–23 data will not be representative due to residual COVID-19 impacts. It recommended updating the model with data from later years when available.

23 Victoria supported updating the model, but recommended retaining the 2020 Review expense data until state urban transport provision had returned to steady post-COVID-19 levels. Victoria suggested using data from 2025–26 and updating the coefficients in the 2028 Update.

24 While Queensland had concerns about the validity of the regression model, it supported updating the model with 2022–23 data so that it would be more contemporaneous.

25 South Australia supported the use of an additional year of data but noted that the 2023–24 data should be critically analysed before being introduced in the 2026 Update.

Commission response

26 The Commission considers that updating the assessment with 2022–23 net expense data improves contemporaneity and better reflects post-COVID-19 urban transport provision.

27 The Commission acknowledges that transport provision and demand may not have fully reached a post-COVID-19 equilibrium by 2026. However, the Commission considers that urban transport needs post-COVID-19 are better reflected by the 2022–23 data than the 2014–2016 data.

Commission decision

28 The Commission has updated the regression using 2022–23 net expense data.

29 The Commission intends to update the regression with 2023–24 net expense data for the 2026 Update.

Economies of density

30 In response to state comments, the Commission considered whether the population-weighted density variable appropriately reflects economies of density in urban transport provision.

State views

31 New South Wales and Victoria said economies of density are adequately accounted for in the regression through the logarithmic treatment of passenger numbers.

32 New South Wales said that while economies of density exist between fixed transport networks, transport networks change to accommodate increased demand over time.

33 Victoria said that policy neutrality concerns surrounding density are not supported by available data. Victoria considered that differences in density between states were largely a result of historic decisions and non-policy influences.

34 Queensland said that state decisions concerning the density of development (infill development and greenfield development) were influencing the density of individual urban areas, causing bias in the regression model. It suggested that the higher net expenses observed for Sydney and Melbourne were due to an above average provision of public transport services. Queensland acknowledged that an assessment based solely on logarithmic variables would theoretically account for economies of density. However, it said that the assessment does not fully account for economies of density because approximately 60% of the model's distribution is driven by the linear population-weighted density variable.

35 Tasmania considered that the existence of economies of population density meant that urban transport expenses were overstated for large cities, such as Sydney and Melbourne.

Commission response

36 The Commission gave detailed consideration to economies of population density in the Draft Report and addendum to the Draft Report. While the marginal cost per passenger should decline as the number of passengers on public transport increases, evidence from the relevant literature combined with Commission analysis did not indicate that economies of population density exist in Australian urban transport systems.

37 The Commission considers that the logarithmic model of passenger numbers appropriately captures economies of scale from increased passenger use of public transport. Passenger numbers reflect service provision, which becomes more efficient as more passengers buy tickets on a fixed transport service. Population-weighted density represents the demand that drives the size of the overall system. The Commission does not consider economies of population density apply to urban transport networks in Australia. Thus, the linear model of population-weighted density remains appropriate.

38 The Commission considers that differences in density are largely due to historical decisions and non-policy factors such as topography. The Commission analysed ABS-provided state density data since 2001 and found evidence that the density of Sydney and Melbourne has been rising at a similar rate to other capital cities. This confirmed analysis in the 2020 Review that suggested the 4 largest states had similar policies regarding urban sprawl.

Commission decision

39 The Commission will retain the population-weighted density variable in the model.

Measurement of population-weighted density

40 The Commission proposed changing the measure of population-weighted density from a measure based on SA1s to a square kilometre grid. Compared with the SA1 measure, the square kilometre grid approach is consistent in size and shape across urban areas, and addresses state concerns about volatility when SA1 borders are redefined, and compositional differences between Significant Urban Areas. It is also consistent with standard international measures of population density.

State views

41 Most states agreed that population-weighted density should not be calculated using SA1s.

42 New South Wales preferred the square kilometre grid to using SA1s but considered the Statistical Areas Level 2 (SA2) areas to be superior. It said SA2s more accurately reflect the level at which transport decisions are made and can more accurately account for hyper-localised areas of density.

43 Victoria did not support the use of square kilometres, saying this could underestimate density in coastal areas and have lower explanatory power than SA1s. It also said that changing the measure to reduce volatility in the assessment did not justify the large change in the distribution of GST, and the population-weighted density measure was not significantly volatile in the context of other volatility in GST distribution. Victoria questioned why transport was singled out when no method changes were proposed to reduce volatility in the property tax and mining revenue assessments. Victoria also presented its review of the literature, concluding there is no consensus in favour of using a square kilometre grid. It proposed retaining the SA1-based measure.

44 While Queensland did not support the use of population-weighted density it considered the square kilometre grid was an improvement over the SA1-based measure.

45 South Australia supported the use of the square kilometre grid, noting that issues around boundary intersections between the grid and Significant Urban Areas will need to be considered.

46 The ACT did not support replacing the SA1-based measure with the square kilometre grid. It said that it is a departure from the original model and would not reflect true demand for transport services. It argued that under the square kilometre approach, the size of Urban Centres and Localities would have more weight than population concentrations.

47 The Northern Territory supported the use of the SA2-based measure, as the square kilometre grid cannot be mapped directly to Urban Centres and Localities used in the assessment. The Northern Territory considered that the square kilometre measure would under-estimate density for smaller urban areas.

Commission response

Boundary issues

48 The Commission notes that the measures of population-weighted density based on the square kilometre grid requires adjustments to align with geographies used in the assessment. This is also true for SA2s. While the SA2 is part of the Australian Statistical Geography Standard, it does not align to the Urban Centres and Localities measure that is used in the transport assessment.

49 The Commission has designed its approach to calculating population–weighted density based on the square kilometre grid such that it maximises precision at Significant Urban Area boundaries. The Commission has elected to include those square kilometres where more than 50% of it is in the Significant Urban Area. This approach maximises the number of areas included in the calculation of population-weighted density measure without introducing unnecessary bias.[3]

50 The SA1 and SA2 areas better capture smaller parcels of land on the fringes of urban areas, including those in coastal areas. However, these measures, especially SA1s, are subject to high volatility.

51 Due to the need to maintain consistent population ranges for the SA1s and SA2s, boundaries can be split or altered following a census. This can lead to changes in density that are not driven by underlying population changes, limiting the usefulness of SA1s and SA2s in reflecting changing transport demand. This was evident in the 2021 Census, where 8% of the boundary changes for SA2s were necessary to ensure that SA2 populations did not exceed the 25,000 threshold.[4]

52 The Commission considered the trade-off between better capturing smaller parcels of land on the fringes of urban areas with the greater volatility of the measure of population density and concluded that the importance of minimising volatility caused by boundary changes was more important than the benefits of capturing land on the fringes of urban areas.

Consistency in area size and population concentration

53 When calculating population-weighted density, the size and shape of the sub-areas influences the population-weighted density obtained.[5] Given the Commission's focus on comparing the different needs of states, it is preferable that the data for

[3] Only including square kilometres where the centre of the square kilometre lies within the urban area resulted in population-weighted density for some urban areas being unrealistically high which would introduce bias into the assessment.

[4] ABS, Changes from the previous edition of the ASGS, 2021, accessed 9 September 2024.

[5] The smaller the sub-area, the higher its recorded value of density. If 2 Significant Urban Areas have the same population sizes and concentrations, the urban area with smaller sub-areas would have a higher recorded population-weighted density.

each Significant Urban Areas are comparable by having equally sized sub-areas. As shown in Table 1, there is significant variation in the size of SA1s and SA2s between Significant Urban Areas.

Table 1 Average area of capital cities by SA1 and SA2 areas

	Sydney	Melbourne	Brisbane	Perth	Adelaide	Hobart	Canberra	Darwin
	km²	km²	km²	km²	km²	km²	km²	km²
Average area-SA1s	0.21	0.29	0.41	0.38	0.35	0.54	0.33	0.80
Average area-SA2s	6.99	8.84	9.67	10.22	9.84	8.66	3.33 (a)	6.09

Note: Only SA1s within the Urban Centre and Locality boundaries have been considered for this calculation to better reflect Commission calculations of population-weighted density.

(a) Canberra has smaller SA2s on average compared to other capital cities as the ABS aims to capture individual suburbs or communities in a single SA2. These SA2s also have smaller populations on average.

54 The Commission considers that the volatility in the recurrent urban transport assessment is different to that in the property tax and mining revenue assessments. The concern with the volatility associated with the SA1 measure of population density is that a significant amount of the volatility can come from changes to the measure of the driver rather than from the driver itself (such as transport demand). In the case of property tax and mining revenue, the volatility in the assessment comes from volatility in the tax base.

Conclusion

55 In terms of the trade-offs associated with SA1s, SA2s and square kilometre grids as the measure of population density, the Commission concluded that the lower volatility and greater consistency of the types of areas included across states associated with the square kilometre grid approach, outweigh the benefits associated with the ability to capture areas on the fringes of Urban Centres and Localities.

Commission decision

56 The Commission will use the square kilometre grid to measure population-weighted density. A square kilometre grid cell will be included if more than 50% of the area of the cell is within the Significant Urban Area.

Modelling passenger numbers

57 To mitigate the impact of individual state policies, the Commission models the passenger numbers applied to the regression coefficients. The 2020 Review method calculated average passenger numbers for all urban areas within a population range, with or without heavy rail. This meant that as the population in an urban area grows, the urban area can move between ranges, resulting in large changes in modelled passenger numbers for the state.

58 To better reflect the variation of transport use that can exist between cities of similar size, the Commission sought state views on modelling passenger numbers using a regression approach based on urban centre population and the presence of heavy rail.

State views

59 New South Wales supported the use of a regression to model passenger numbers but said that an approach based on population and a heavy rail dummy underestimates Sydney's transport task because it does not recognise the impact of observed passengers and the impact of traffic congestion on public transport use.

60 New South Wales recommended the Commission use population-weighted density as an explanatory variable. As passenger numbers are not strongly linked to density for small urban areas, New South Wales analysis indicated that there are differences in public transport use rates for areas with a population-weighted density of more than 1,750 people.[6] It said that if the Commission derived a threshold using reasonable assumptions about transport service use and congestion, the threshold would have statistical validity and would not be arbitrary.

61 New South Wales also considered it appropriate to use density to model passenger numbers because it is already used in the regression to estimate the impact of demand on costs.

62 Queensland and South Australia supported retaining the 2020 Review method of grouping urban areas by the size of population.

63 Queensland said modelling passenger numbers based on population ranges is more effective in reducing the impact of policy decisions. It said that Sydney and Melbourne could influence the strength of the regression and the passenger numbers obtained. It also said the population ranges approach should not be adjusted as it improves policy neutrality.

64 South Australia noted the Commission's position but preferred to use population ranges used to allocate Significant Urban Areas with indexation to account for growth.

Commission response

65 The Commission considers that an approach that allows for population growth effectively captures the changing rate of public transport use as urban areas grow. The use of fixed population ranges assumes a constant use rate for each Significant Urban Area in the group, which may not reflect actual transport provision. The regression approach allows for the numbers of passengers to increase steadily as the size of cities grows, and accounts for the different needs of Significant Urban

[6] This threshold was based on density measured using SA1 areas.

Areas with a heavy rail service. It also results in a less-volatile approach to modelling passenger numbers compared to the population ranges.

66 Commission analysis found that Sydney and Melbourne do not have an undue influence on the regression compared to other capital cities.[7]

67 The Commission does not consider it appropriate to model passenger numbers based on population-weighted density and a dummy for areas with a density over 1,750 people. Testing of this approach did not produce plausible results, with negative modelled passenger numbers for some urban areas.[8] Additionally, as density is already included as a separate variable in the regression model to capture the demand for public transport, this approach would result in double counting.

68 The Commission considers that modelled passengers obtained under the regression approach provide a better fit to the data than a density-based model. The Commission's approach also ensures that high density urban areas do not have an undue influence on the model.

Commission decision

69 The Commission will use a regression to model passenger numbers based on urban population and the presence of heavy rail services.

Indexing passenger numbers

70 The 2020 Review method used actual passenger numbers based on the 2016 Census journey to work data released by the ABS. To address the impact of COVID-19 on the 2021 Census data, the Commission sought state views on whether it was appropriate to index passenger numbers by applying an annual index based on the Bureau of Infrastructure and Transport Research Economics passenger kilometres data until 2026 Census data are available.

State views

71 Most states supported using an index based on Bureau of Infrastructure and Transport Research Economics data compared to the state ticketing data alternative.

72 New South Wales said Bureau of Infrastructure and Transport Research Economics data would be more comparable between states.

73 Victoria did not support the use of the Bureau of Infrastructure and Transport Research Economics adjustment, saying the data were influenced by COVID-19 levels and growth. Victoria also expressed concern about applying a measure based

[7] Cook's distance is an empirical test used to identify the impact of individual data points on a regression. It measures the impact of each observation on the fitted response values. As both Sydney and Melbourne did not have a result for Cook's distance which exceeded the minimum threshold, they were not determined to have a significant impact on the model.

[8] Density calculated using square kilometres.

on distance travelled to passenger numbers, which could introduce bias. It suggested that similar bias may also exist in the distance to work variable.

74 Queensland did not support the use of commuter passenger data to determine urban transport needs, saying it underestimated the student and concession card holder transport task. If the Commission elected to continue using commuter passenger numbers data, Queensland supported using the Bureau of Infrastructure and Transport Research Economics index. Queensland recommended that the index adjustment should continue to be used once 2026 Census data become available.

Commission response

75 The fall and variability in the Bureau of Infrastructure and Transport Research Economics passenger kilometres data post-COVID-19 indicates the changing nature of public transport use patterns. The Commission considers that applying a Bureau of Infrastructure and Transport Research Economics index to 2016 Census passenger numbers better reflects what states do. The Commission found that maintaining 2016 Census data would overstate public transport provision while an index based on state ticketing data contains greater policy influence.

76 In relation to Victoria's concern regarding the influence of COVID-19 on the distance to work variable, the Commission considers the adjustments made by the ABS to be sufficient to support its continued use in the model.[9]

77 The Commission considers that the passenger numbers obtained using ABS data remain the most consistent and reliable measure of public transport use. The Commission also considers that, once 2026 Census data become available, it will reflect post-COVID-19 commuting patterns and transport provision.

Commission decision

78 The Commission will adjust 2016 Census passenger numbers using the Bureau of Infrastructure and Transport Research Economics index until 2026 Census data become available.

79 The Commission will continue to use 2021 Census distance to work data.

Use of the ferry dummy variable in the model

80 In the transport consultation paper an alternative method of assessing ferry services was proposed based on the proportion of total commuters using ferry services. States raised concerns about the inclusion of non-state ferry services in the commuter proportions and the inability to account for the fixed costs of operating ferries. In response to these concerns, in the Draft Report the

[9] To mitigate the influence of COVID-19 restrictions the ABS directed respondents to use their usual place of work over the previous 4-week period, regardless of whether they travelled to the location on the day.

Commission proposed retaining the 2020 Review method of assessing ferry transport expenses using a dummy variable.

State views

81 New South Wales opposed the use of a ferry dummy variable on the basis that it understated the costs of complex ferry services and overstated the costs of simpler ones. It said the ferry dummy would disadvantage states with a relatively higher share of the public transport task undertaken by ferries. New South Wales supported the inclusion of the Newcastle ferry service in the assessment.

82 Queensland was concerned that the 2020 Review did not consider the scale of ferry services, citing differences between ferry services in Sydney and Brisbane compared to Melbourne. Queensland recommended assessing ferry services based on the proportion of trips taken by ferry in each urban area. Queensland said if the Commission did not support this approach, ferry expenses should be removed from the urban transport assessment and assessed equal per capita. If the ferry dummy is retained, Queensland recommended excluding urban areas where fewer than 1% of public transport passengers use ferry services.

83 South Australia said the insignificance of the ferry dummy in the model justifies its removal from the assessment, while recognising the inclusion of the dummy helps to capture all forms of public transport. South Australia said that, if the Commission decided to account for ferries in the assessment, it supported using the dummy variable.

84 The ACT supported retaining the ferry variable and the proposed corrections to the areas identified as having ferry services.

Commission response

85 The Commission considered Queensland's proposal, but notes that the proportion of trips taken on ferries would result in implausibly high levels of spending for some smaller urban areas.[10]

86 The Commission considers that using cutoffs (for example only including areas with more than 1% of public transport users taking ferries to determine need) would not align with the Commission's definition of urban ferry services and would not reflect need in areas with smaller ferry operations.[11]

87 Furthermore, excluding urban areas with fewer than 1% of public transport users taking ferries would only leave 4 Significant Urban Areas with an assessed ferry service. While using the proportion of ferry passengers would result in 3 Significant

[10] Similar results were obtained using the proportion of commuters using ferries.

[11] An urban ferry service is determined to exist in an urban area if it is possible to both board and alight the ferry service at 2 different wharves/ stops in the same urban area.

Urban Areas determining the impact of ferry spending. Both approaches raise concerns about policy influence.

88 The Commission does not consider an equal per capita approach suitable to assess ferry expenditure given that urban areas without bodies of water cannot have ferry services regardless of size.

89 The Commission considers that, although the ferry variable is insignificant in the regression model, it is important to capture all state transport services and to reflect what states do. The omission of the variable would fail to account for the costs associated with operating a ferry network.

Commission decision

90 The Commission will retain the ferry dummy variable.

Blending

91 The Commission sought state views on a proposed temporary 10 percentage point increase in the weight applied to the urban population driver in the blended recurrent urban transport assessment, which would increase the weight from 25% to 35%. This was to recognise data issues arising from COVID-19 necessitating the use of older data until post-pandemic data become available. Once fit-for-purpose 2026 Census data become available in 2027, the Commission proposed the blending ratio would return to the 75:25 split. The ratio for the investment assessment would remain 75:25.

State views

92 New South Wales supported the decision to retain the 2020 Review blending ratio in the investment assessment but did not support an increase to the blending ratio for recurrent expenses. It suggested that the blending ratio does not recognise the robustness and reliability of the urban centre characteristics model, and that in the absence of any data concerns from COVID-19, the Commission should consider reducing or removing blending based on the outputs from the 2025 Review. New South Wales also proposed that the Commission seek authority to review and implement a reduction or removal of blending as part of the 2028 Update.

93 New South Wales also sought confirmation that the temporary increase in the blending ratio for recurrent expenses will be removed once 2026 Census data become available.

94 Victoria did not support increasing the blending ratio for the urban transport component, saying the 75:25 blending ratio sufficiently addresses any data concerns. Victoria supported increasing the blending ratio for investment in urban transport. It considered that if the Commission increased the blending ratio in the recurrent assessment it should also increase the investment assessment blending ratio because the same model is used in both assessments. Victoria also said that

the justification for blending in the investment assessment was stronger because the urban transport regression was designed to model recurrent expenses and does not fully capture investment needs.

95 Queensland supported a permanent increase to the blending ratio to an equal blend between the regression model and urban transport passengers (if the Commission retains its proposed approach).

96 Western Australia supported increasing the blending ratio for investment in urban transport to 50:50. It said that discounting the urban transport assessment to reflect method unreliability would be consistent with the use of discounts in other assessments.[12]

97 Tasmania supported increasing the blending in the recurrent assessment and proposed that the higher blending ratio for recurrent expenses be retained until the next methodology review. Tasmania supported retaining the 2020 Review blending ratio in the investment assessment.

Commission response

98 While improvements have been made to the model, limitations associated with the use of proxies and the use of limited data remain. The Commission considers blending remains appropriate in the 2025 Review.

99 The Commission notes that COVID-19 has caused problems with the quality of the 2021 Census data, justifying a temporary increase to the blending ratio used in the recurrent assessment. The Commission also considers that COVID-19 did not have a significant impact on investment decisions, which are made over a longer timeframe.

100 The Commission notes Victoria's concerns regarding the use of recurrent urban transport expense methods to assess investment needs. The Commission considers that the use and cost of transport services provides a reasonable proxy for transport asset need. In addition, blending the model with urban population squared in the investment assessment recognises the relationship between population growth and transport asset requirements.

101 The Commission considers that the impact of COVID-19 on the assessment is not sufficiently large to support an increase in blending in the recurrent or investment assessments to 50:50. The Commission does not consider that discounting the assessment is warranted. The temporary increase in the blending ratio is in response to data issues associated with COVID-19 and will be removed once fit-for-purpose 2026 Census data become available as part of the 2028 Update.

[12] Western Australia proposed discounting through increased blending in the recurrent assessment and a discount towards equal per capita for the investment assessment.

Commission decision

102 The Commission will temporarily increase the blending in the recurrent urban transport assessment by 10 percentage points, and this will be removed once fit-for-purpose 2026 Census data become available as part of the 2028 Update.

103 The Commission will not increase the blending ratio in the investment assessment.

Use of state shares of squared populations in the urban transport investment assessment

104 The Commission re-examined the appropriateness of modelling investment costs based on state shares of urban populations squared.

State views

105 Most states supported the population squared measure in investment.

106 Queensland did not support the use of squared populations, saying that it incentivises overinvestment in Sydney and Melbourne. Queensland recommended that the population squared driver should be replaced by urban population shares.

107 Western Australia opposed the use of the population squared model because it does not mitigate the impact of the regression model. It proposed that per capita asset costs should be fixed with respect to urban population.

108 South Australia proposed that the population squared model be re-evaluated as part of future reviews.

Commission response

109 The Commission's analysis outlined in the Draft Report provided evidence that the squared population shares in conjunction with the regression model remains the most appropriate measure of state investment needs for urban transport. This relationship has remained mostly unchanged since the 2015 Review. The use of population shares would not accurately reflect state need, or what states do.

110 The Commission re-tested the strength of the relationship between urban transport asset needs and state populations excluding Sydney and Melbourne. Analysis showed that using state shares of urban populations would over-estimate needs for the majority of smaller Significant Urban Areas. The Commission considers squared urban populations continues to be a better predictor of state needs than urban populations.

111 In contrast to blending in the recurrent assessment, the population squared method is not a response to data issues in the transport regression. Rather, the Commission has determined it to be a suitable measure of demand for transport infrastructure which, when blended with the regression, effectively estimates state needs.

Commission decision

112 The Commission will continue to use state shares of urban populations squared in modelling urban transport investment costs.

Allocation of expenses between urban and non-urban transport (V/Line)

113 In response to state comments, the Commission considered the allocation of Victoria's V/line expenses to the urban transport component.

State views

114 Victoria said a greater percentage of V/Line expenses should be allocated to the urban transport component. It sought a further adjustment to account for intra-urban V/Line travel. Analysis by Victoria, using weighted passenger kilometres, indicated that 20.2% of V/Line expenses related to urban transport.

115 Queensland supported allocating V/Line expenses between urban and non-urban transport but did not support the increase in the proportion allocated to urban transport. Queensland considered that a significant proportion of spending on urban services in New South Wales and Queensland is more related to inter-urban travel and should be moved to the non-urban transport component.[13]

116 The Northern Territory did not support an allocation of urban transport subsidy expenses based on passenger numbers. It also said that any adjustment to include such subsidies in urban transport should not be made outside a review year.

Commission response

117 The Commission noted the evidence provided by Victoria, which disaggregated V/Line trips occurring within an urban area weighted by the relative kilometres travelled by these passengers. This analysis indicated that the 20.2% of total weighted patronage on V/line services occurred within a Significant Urban Area. The Commission examined the data provided and concluded this was a reasonable method of calculating inter-urban V/Line travel. While the Commission acknowledges that not all V/Line expenses are driven by passenger use, weighting by kilometres travelled partially offsets the additional costs faced by operating regional train services.

118 The Commission aims to ensure that expenses are allocated to the correct component based on the definitions of urban and non-urban travel. Following the 2025 Review, the Commission will request total weighted patronage data from other states to determine if the 2020 Review method of allocating their regional train expenses between the components is suitable. Any adjustment to transport

[13] The Commission's definition of urban transport is based on the ability to use public transport services to travel within an urban area.

budget data will be made in a future update in accordance with the Commission's process for implementing adjustments to Government Finance Statistics data.[14]

Commission decision

119 The percentage of V/Line expenses allocated to urban transport will be increased to 20.2%.

120 After receipt of additional data, the Commission will consider whether similar adjustments are required in other states.

Non-urban transport

121 The Commission sought state views on using census train passenger numbers to assess non-urban transport in the transport consultation paper. Following feedback from states, this position was changed in the Draft Report to continuing to assess non-urban spending equal per capita.

State views

122 Most states supported retaining the 2020 Review method of assessing non-urban transport spending equal per capita, noting that using actual heavy rail passengers would not be suitable due to policy influence.

123 New South Wales supported using non-urban train commuters as a driver of transport needs but noted that adjustments may be required to align passenger and expense data with the Commission's definition of urban transport.

124 South Australia supported continuing with an equal per capita assessment of non-urban transport in the absence of a suitable alternative.

125 Queensland did not support an equal per capita assessment of non-urban transport. It proposed an assessment based on population dispersion.

126 Western Australia opposed the use of actual passenger numbers in the non-urban transport assessment due to concerns about policy neutrality. It supported retaining the equal per capita distribution.

Commission response

127 The Commission considers that the potential for both urban and non-urban populations to use non-urban train services justifies the use of total state populations.

128 While there may be additional costs associated with providing transport services in remote areas, this needs to be balanced against the additional costs of providing more frequent and higher-capacity services between large urban centres (for

[14] See the adjusted budget chapter of *Review Outcomes*.

example Gold Coast to Brisbane, or Geelong to Melbourne). These competing cost pressures would not be reflected in an adjustment only for remote areas.

129 In addition, for most states, the share of non-urban transport expenses is not consistent with the share of remote populations.

Commission decision

130 Non-urban transport expenses will continue to be assessed equal per capita.

Other issues

131 The Commission sought state views on moving pipeline and other transport expenses from urban transport to non-urban transport.[15]

132 In the Draft Report the Commission proposed retaining all school transport expenses in the urban transport assessment.

State views

133 All states either agreed with the pipeline proposal or did not have specific comments.

134 Western Australia said the Commission should consider a separate assessment of school transport expenses as part of the forward work program.

135 Queensland also recommended the Commission include non-urban school transport services in the non-urban transport category.

Commission response

136 The Commission agrees that pipeline and other transport expenses are better assessed in the non-urban transport component.

137 All student transport expenses were included in the urban transport assessment in the 2020 Review because it was not possible to accurately separate spending on urban and non-urban student transport. The Commission is not aware of any improvements to the data and have no data to support a split.

138 The Commission will investigate alternative methods to assess school transport spending following the 2025 Review in preparation for the next review.

Commission decision

139 The Commission will include pipeline and other transport expenses in the non-urban transport component. Non-urban school transport will remain in the urban transport assessment.

[15] Pipeline and other transport expenses are defined in the Australian System of Government Finance Statistics: Concepts Sources and Methods, 2015. Expenses relate to the operation, construction, and maintenance of pipelines (for example, those used for the transportation of petroleum and natural gas) and other transport systems including funiculars, cable cars and chairs lifts.

GST impacts of method changes

140 The impact on the GST distribution from the method changes is shown in Table 2.

141 Table 2 shows 2 effects from the change to using the square kilometre grid-based measure of population-weighted density. Firstly, states' shares of the new measure differ from their shares of the SA1-based measure. The GST effect of this is shown in the 'change to square km density measure' line in Table 2. The second effect is that the regression coefficients will change when the regression is recalculated with new net expense data and method changes are applied to the independent variables. This effect is captured within the 'recalculate urban centre characteristics regression' line in Table 2.

Table 2 Impact on GST distribution of method and data changes, recurrent urban transport, 2024–25 to 2025–26

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total effect
	$m	**$m**	**$m**	**$m**	**$m**	**$m**	**$m**	**$m**	**$m**
Change to square km density measure	-254	-194	132	178	126	16	-7	3	455
Modelling passenger numbers	0	12	-5	10	-14	-2	-2	-1	23
Recalculate urban centre characteristics regression	130	-14	-50	-42	-44	11	10	-1	150
Change blending proportions	-158	-50	90	45	32	16	17	8	208
Changes to allocation of expenses	14	7	-9	-4	-4	-2	-1	-1	22
Other changes	1	2	-3	1	0	1	0	-2	5
Total	**-267**	**-235**	**155**	**188**	**96**	**40**	**17**	**6**	**502**
	$pc	**$pc**	**$pc**	**$pc**	**$pc**	**$pc**	**$pc**	**$pc**	**$pc**
Change to square km density measure	-29	-27	23	58	66	27	-15	13	16
Modelling passenger numbers	0	2	-1	3	-7	-3	-4	-3	1
Recalculate urban centre characteristics regression	15	-2	-9	-14	-23	19	20	-3	5
Change blending proportions	-18	-7	16	15	17	28	35	32	7
Changes to allocation of expenses	2	1	-2	-1	-2	-4	-2	-5	1
Other changes	0	0	-1	0	0	2	0	-9	0
Total	**-31**	**-33**	**27**	**61**	**50**	**69**	**35**	**25**	**18**

Note: The allocation of expenses relates to changes to the allocation of V-line expenses, moving pipeline expenses to the non-urban component and the removal of adjustments that are no longer material.
Changes to the wage costs assessment are not included. They are shown in the wage costs chapter of *Review Outcomes*.

142 The change in the GST distribution compared to the 2024 Update was due largely to the change to a square kilometre-based measure of population-weighted density. Using the square kilometre grid reduced the densities of large cities relative to smaller regional cities. Sydney and Melbourne have lower relative densities under the square kilometre-based measure which has reduced the assessed needs of New South Wales and Victoria as shown in Table 2. Conversely, smaller cities have a higher relative density than before, increasing the assessed needs of all other states for recurrent expenses and investment.

143 The GST impact from recalculating the urban centre characteristics regression reflects the increased influence of population–weighted density and the reduced influence of passenger numbers.[16]

144 The increase to the blending ratio reduced the assessed needs of New South Wales and Victoria.

145 The impact on the GST distribution from the urban transport investment assessment is shown in Table 3. This results from the recurrent method changes flowing through to the investment assessment. For a detailed explanation of these changes see the investment chapter of *Review Outcomes*.

Table 3 Impact on GST distribution of method changes, transport investment, 2024–25 to 2025–26

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total effect
$m	5	-40	-193	198	57	26	-49	-3	285
$pc	1	-6	-34	65	30	44	-101	-11	10

Note: Changes to the wage costs assessment are not included. They are shown in the wage costs chapter of *Review Outcomes*.

[16] The regression was re-estimated using updated net expense data, incorporating method changes to population-weighted density and indexing actual passenger numbers.

Appendix A

Table A-1 Impact of remoteness variables on the urban transport regression model

Variable	R2025 model coefficients	R2025 model – including remoteness categories
Intercept	-197.22	-40.46
Population-weighted density	0.16	0.17
Heavy rail passengers	9.08	-4.42
Bus and light rail passengers	10.74	5.31
Distance to work	2.08	1.60
Mean slope	12.51	12.60
Ferry	40.45	72.92
Inner regional		-146.69
Outer regional		-132.46
Remote and very remote		-116.11
Adjusted R-squared	0.7774	0.7824
Residual standard error	78.07	77.18

Note: major cities are used as the reference category in the models incorporating remoteness categories.
2022-23 net expense data and square kilometre population-weighted density has been used to estimate the regression.

Population-weighted density in the literature

146 Victoria referred to evidence of a variation in the definition of population-weighted density in the literature. While there is substantial variation in the sub-areas used to calculate population-weighted density, there is a preference for consistency in size where such data are available.[17] SA1s are designed to be consistent in population, not area, so cities that are denser have smaller SA1s on average compared with areas which are not as dense. An example of this is the Sydney Significant Urban Area, which has an average SA1 size of 0.21km^2, compared to 0.29km^2 in Melbourne and 0.41km^2 in Brisbane.

[17] J Ottensmann, 'The Use (and Misuse) of Population-Weighted Density', ResearchGate, 2021, accessed 5 February 2025.