

Measuring the length of State-type roads

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Abstract

The Commission's roads assessment focuses on State¹ government financial requirements to manage the roads for which they are responsible. To do this the Commission needs a common definition of State managed roads to ensure that the Commission's measurement of the financial requirement for maintaining State type roads reflect the States' circumstances beyond their control, such as geographical size and population dispersion, rather than their own policy decisions on the classification of roads. Using road length based on individual States' own definitions of State managed roads was not an option because these definitions are not consistent across the eight States. As there is currently no nationally consistent functional classification of roads, we have sought to develop a methodology to measure the length of roads that States are usually responsible to maintain.

We used routing software to develop a Commission-defined State rural road network with parameters informed by an analysis of States' actual rural road networks. Rural road length was measured as the total length of the Commission-defined rural road network with weights applied to recognise additional lane requirements.

The Commission intends to use this measure of rural road length, subject to further consultation with the States, to assess State road expenditure requirements in the 2020 Review of methods for allocating goods and services tax (GST) revenue among the States. Given difficulties faced in developing a similar measure of urban road length, the Commission intends to assess urban road length needs using urban populations. Our work highlights the need for a national classification of roads.

1 Introduction

The Commonwealth Grants Commission (the Commission) conducts annual inquiries to advise the Commonwealth Treasurer on the sharing of the GST revenue across the States and Territories (the States).² These inquiries seek to allocate the GST such that each State is able to provide the average standard of services and associated infrastructure for its population, if it makes the average effort to raise revenue and operates at the average level of efficiency (CGC 2015).

¹ State refers to the six States and two Territories.

² Information on the history of the Commission, the Australian framework for federal financial relations, and other reference materials are publicly available for download from the Commission's website.

This objective requires separate assessments across a range of State provided services and revenue streams (expenditure and revenue assessments respectively). These assessments are then aggregated to calculate the funding requirement for each State, according to the principle of horizontal fiscal equalisation.

The Commission is currently conducting its 2020 Review; this is a five-yearly review of the methodology underlying the measurement of State fiscal capacities, and as such, of each expenditure and revenue assessment.³ One of these assessments is Roads.

The Commission calculates what States need to spend on road maintenance, capital expenditure and associated functions so that each State can provide the average level of service. The Commission recognises that road length, traffic volume and heavy vehicles use are important drivers of differences in State expenditure.⁴

The re-estimation of State managed road length was a significant achievement in the 2020 Review. The purpose of this extract is to briefly present our current progress in refining our measures of rural and urban road length.

2 Objective

The responsibility for road management and maintenance in Australia is split between State and local governments. The Commission's roads assessment focuses on the States' financial requirements to manage the roads for which they are responsible. The Commission recognises a difference between road length that is due to States' circumstances beyond their control, such as geographical size and population dispersion, and those that are due to State policies, such as individual State definitions of State roads. The Commission aims to measure the financial requirement of States only for influences that are beyond their control.

Therefore, the Commission needs a common definition of State roads across all States. There is currently no nationally consistent functional classification of roads in Australia. States have their own functional classifications and they are not consistent. While work is being undertaken to develop a national standard, this is still some way off.

In the absence of a standard national classification, we sought to develop a methodology to measure the length of roads that States are usually responsible to maintain. Our aim was to apply to all States the same criteria to estimate the length of State managed roads on a comparable basis.

³ The draft 2020 Review report including a Roads attachment is due for publication in July 2019 (CGC 2019). The final report will be published in February 2020.

⁴ The methodology used by the Commission is largely shaped around the National Transport Commission's (NTC) PayGo model (NTC 2016). NTC data on expenditure also identifies that relating to local roads and other roads services. However, these components are not assessed separately as they do not meet the Commission's materiality threshold of redistributing more than \$35 per capita for any State when compared to an equal per capita distribution.

3 Methodology

Separate methodologies were developed for rural and urban State roads. Urban roads were defined as those within urban centres (ABS Urban Centre/Localities (UCLs)) with population greater than 40 000. Rural roads were the remainder.

To measure State road length, we used Pitney Bowes RouteFinder and the RouteFinder links dataset. In addition, we collected detailed spatial information on State road networks from the States.

3.1 Rural road length

We compared States' road functional classifications to determine the types of roads that are normally classified as State roads. Our conclusion was that State roads are those that:

- connect urban centres
- connect significant areas (national parks, touristic areas, mines, agricultural sites and dams) to urban centres or ports.

Using the routing software, we connected through the fastest route:

- UCLs with a population greater than 1 000 (major urban centres) to all adjacent major urban centres. Adjacency was defined as centres with an adjacent voronoi polygon border.⁵
- UCLs with a population of less than 1,000 were connected to their nearest two major urban centres where a connection existed. We chose two connections because our analysis showed UCLs of this size have on average of two connections.
- Significant areas; national parks were connected to their nearest network intersections, mines were connected to their nearest port, and ports were connected to their nearest UCL.

Road length was measured as lane-kilometres to recognise the additional costs of building and maintaining multi-lane roads. Because data on lane-kilometres were not comprehensive, we assumed a minimum of two lanes for all roads, additional lane length was then estimated using the State provided roads data.

As a reality check, we compared the State-defined rural road length with the Commission's estimates. **Table 1** shows the differences between the length of State defined State roads and the length of State roads based on the Commission's definition. For example, Western Australia's actual road length is significantly less than our estimates. This aligns with expectations given their policy of allocating responsibility for some State-type roads to local governments.

⁵ A voronoi polygon partitions a plane with points into convex polygons such that each polygon contains exactly one generating point and every point in a given polygon is closer to its generating point than to any other.

Table 1: Measure of rural road lengths, actual and using the methodology outlined in this abstract, lane-kilometres

	NSW	Vic	Qld	WA	SA	Tas	ACT	NT	Total
	km	km	km	km	km	km	km	km	km
Actual (a)	72 613	43 356	65 918	36 584	24 097	7 764	1 320	32 802	284 454
Commission definition	74 584	39 729	78 926	53 229	29 832	8 606	295	28 608	313 809
	%	%	%	%	%	%	%	%	%
Actual share	25.5	15.2	23.2	12.9	8.5	2.7	0.5	11.5	100.0
Commission share	23.8	12.7	25.2	17.0	9.5	2.7	0.1	9.1	100.0

(a) The actual rural road lane-kilometres assumes a minimum of two lanes and excludes local and local type roads in unincorporated areas that were included in the State provided spatial data. Specifically, it excludes New South Wales roads with a local or unincorporated road classification, South Australian roads with a rural local classification and Northern Territory roads with a NAASRA classification of 5: roads used almost exclusively for one activity or function which have not been otherwise assigned.

Source: State road spatial data and Commission calculations using RouteFinder Links dataset.

The Commission intends to use this measure of rural road length, subject to further consultation with the States, to assess State road expenditure requirements in the 2020 Review.

3.2 Urban road length

For the 2020 Review, we investigated using a similar approach to that used to measure rural road length to develop a State urban road network. However, this was not successful given the intricacies of these networks. We could not identify the common characteristics of the urban roads that States are responsible for maintaining. Our attempts showed significant discrepancies in our estimates of urban road length and the State-defined urban road length.

As a fall back, the Commission intends to measure the State shares of urban roads using the State shares of population living in urban centres with population greater than 40 000. Analysis of actual urban road networks indicates that State shares of urban road length are broadly similar to State urban population shares.

4 Key insights

The Commission-defined rural road network aims to measure the length of each State's road network using a common definition. It does not reflect any value judgments as to the efficiency or outcomes of any individual policy.

Work completed in developing the Commission-defined road network included identification of where State road classifications do not readily translate to a national standard. This has highlighted the need for a national functional classification for roads.

5 Conclusions

The Commission has developed a more accurate measure of rural road length for its 2020 Review. These improvements from past reviews were made possible through the availability of detailed State spatial data on roads.

This work highlights the need for a national classification of roads. Such a classification remains the ideal basis for measuring State-managed rural and urban roads.

6 References

Commonwealth Grant Commission (CGC) 2015. *Report on GST Revenue Sharing Relativities – 2015 Review*. Available at: <https://cgc.gov.au/inquiries/2015-review>.

Commonwealth Grant Commission (CGC) 2019. *Draft Report on GST Revenue Sharing Relativities – 2020 Review*. To be published at: <https://cgc.gov.au/>.

National Transport Commission 2016. *PayGo – Heavy Vehicle Charges Model*. Version 2.1. Available at <https://www.ntc.gov.au/heavy-vehicles/heavy-vehicle-charges/>.