ESSENTIAL SERVICES COMMISSION

Measuring productivity in the local government sector

Consultation paper

September 2017

An appropriate citation for this paper is:

Essential Services Commission 2017*, Measuring productivity in the local government sector*: *Consultation paper,* September.

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Executive summary

The purpose of this consultation paper is to facilitate feedback from the local government sector and interested parties on a study we have undertaken. The study examines the underlying productivity trends in the local government sector and the options identified to estimate an efficiency factor.

We engaged Predictive Analytics Group and Deloitte Access Economics to help us generate productivity trends and a possible methodology to calculate the efficiency factor for inclusion in the rate cap formula. The findings of their reports (attached) are discussed in this paper.

We also established a working group of members from the local government sector, sector peak bodies and Local Government Victoria. The working group provided insights and understanding about what is driving productivity trends across the Victorian local government sector and we tested the preliminary findings of the study with members of the group.

This is the first time an attempt has been made to systematically measure the productivity of the Victorian local government sector based on the best information available. The study's initial findings are an important starting point for measuring productivity meaningfully in the sector. We will consider whether we need to undertake further work to develop greater insights to assist the sector to better understand the implications of measuring productivity.

Why undertake a productivity study?

In 2015, the Victorian Government introduced the Fair Go Rates system which caps the annual amount that councils can increase their general rates without seeking approval. The Fair Go Rates system confers on the commission a number of roles including advising the Minister for Local Government on the annual rate cap and assessing council applications for a higher cap.

In September 2015, we issued our final report on the local government rate capping and variation framework.[1] We advised the minister that the annual rate cap should take into account changes in the Consumer Prices Index (CPI) and the Wages Prices Index (WPI) and include an efficiency factor.

The intended aim of the efficiency factor is to create incentives for councils to operate more efficiently and ensure that efficiency gains are shared with ratepayers in the form of lower rates.

We said that we would undertake a detailed productivity analysis of the sector to assess the appropriate longterm rate for the efficiency factor.

Incorporating an efficiency factor into pricing formulas is a common way in other sectors to encourage service providers to pursue efficiencies in their operations and pass them on to customers.

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[1] Essential Services Commission 2015, *A Blueprint for Change, Local Government Rate Capping & Variation Framework Review — Final Report*, September.

How the efficiency factor relates to the rate cap

Under section 185D of the Local Government Act 1989, the Minister for Local Government sets the average rate cap based on the change to CPI over the financial year to which the cap relates, plus or minus any adjustments.

Each year since 2016–17, pursuant to section 185D (3)(a) of the Act, the minister has asked the commission for advice on setting the level of the average rate cap.

Consistent with the broad approach developed through the rate capping review, our advice in both years used the formula in Box 1.

Box 1 Formula to calculate average rate cap (ARC)

ARC = (0.6 x CPI) + (0.4 x WPI) – efficiency factor

The formula applies a 60 per cent weighting to the rate of increase in the CPI and a 40 per cent weighting to the rate of increase in WPI, less an efficiency factor. We recommended to the minister that the efficiency factor be set at zero for the year 2016–17 and 0.05 per cent for 2017–18.[2]

For both 2016–17 and 2017–18, the minister adopted an average rate cap that was consistent with forecast CPI with no other adjustments.

We will be asked by the minister annually for our advice on an appropriate rate cap. At this stage, we anticipate that our approach will be to continue to include an efficiency factor which will be informed by the outcomes of this productivity study.

Our consultant's analysis of productivity trends

Predictive Analytics Group used data envelopment analysis to measure productivity trends for the local government sector. Data envelopment analysis is a well–established method to estimate productivity. It has been widely used to estimate productivity levels in the local government sector in other jurisdictions.

Data envelopment analysis uses inputs and outputs related to each council to calculate a production frontier using linear programming.[3] The frontier represents full technical efficiency — the point at which the highest output occurs given specified inputs or the point at which the lowest amount of inputs are used to produce a specified quantity of output.

Importantly though, data envelopment analysis is a relative measure. In this case it measures a council's efficiency against the other measured councils, and not a hypothetical 'perfectly efficient council'. Just because a council is on the frontier doesn't mean that potentially large technical efficiency gains can't be made. The further a council is from the frontier the lower its technical efficiency relative to its peers.

Predictive Analytics Group proposed five possible input–output combinations for data envelopment analysis to calculate technical efficiency and productivity trends.

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2 Our advice can be found on our website (www.esc.vic.gov.au).

3 Linear programming is a mathematical technique to achieve the highest outcomes (referred to as technical efficiency) given a range of variables.

Table 1 Possible input–output combinations for data envelopment analysis

Model Number	Inputs	Outputs
1	council staff ($) capital ($)	households, businesses, roads (km)
2	council staff (FTE) capital ($)	households, businesses, roads (km)
3	council staff ($) capital ($)	households, businesses, roads (km), waste collected (tonnes)
4	capital ($) operating expenses (excl. depreciation) ($)	households, businesses, roads (km)
5	operating expenses (excl. depreciation) ($) + depreciation ($)	households, businesses, roads (km)

Source: Predictive Analytics Group

We believe the models developed by Predictive Analytics Group capture the main inputs used by councils. The number of households, businesses and length of roads serviced act as proxies for the bundle of services delivered by councils. These proxies are common to all councils and this helps to alleviate the issue of not being able to compare councils because of differences in the types and quality of services delivered.

Our consultant used the best available data sourced from the Victoria Grants Commission to undertake the analysis.

Predictive Analytics Group found that regardless of the model specification (refer to table 1) used, productivity in the Victorian local government sector had declined over the period 2010–11 to 2015–16.

Over the same period, Australian Bureau of Statistics (ABS) data showed total factor productivity across the broader economy has increased slightly. Thus productivity in the local government sector is falling behind and going in a different direction to that of the broader economy.

This suggests that there remains a need for councils to improve their efficiency to be more in line with the general economy. The Fair Go Rates system can provide incentives to promote the pursuit of greater efficiency.

What are some possible approaches to set the efficiency factor?

This paper identifies four possible approaches to set an efficiency factor:

1. A small, notional factor of 0.05 per cent cumulatively. In other words, each year add 0.05 per cent to the previous year's efficiency factor, but capped in the longer term. [4]
2. A proxy value drawn from historic Australian industry productivity data collected and calculated by the ABS.
3. A value calculated using data from the data envelopment analysis described above. Our consultants have identified a range of values from 0.01 to 0.09 per cent.

[4] Consistent with the approach recorded in Essential Services Commission 2015, *A Blueprint for Change, Local Government Rates Capping & Variation Framework Review — Final Report*, September.

4. Using performance data from the local government performance reporting framework to inform the efficiency factor.

We found that efficiency factors generated by the first three approaches are broadly similar and could be considered modest, as shown in table 2.[5] Further work will still need to be done if approach four above is used.

Table 2 Estimated efficiency factors

Approach	Efficiency factor (%)
Notional	0.05
Proxy[a]	0.17
Data envelopment analysis[b]	0.01–0.09

[a] Latest five year average (16 industries) value added multifactor measure. [b] Range of all values in table 3.2.

Choice informed by following considerations

We considered each approach against a range of well established regulatory criteria. Each approach has strengths and weaknesses; however the data envelopment analysis approach best meets the criteria.[6] The data envelopment analysis approach is accurate, applicable and comprehensive in that it is based on data that relates to the sector. However it is the most complex to explain and understand, and is the least cost effective. This approach also relies on judgements from the commission about the level of efficiency gains and the timeframe over which gains can be achieved.

Although the local government performance reporting framework is accurate it only measures unit costs on a per service basis. It is not a total factor productivity measure.

The strength of the proxy approach is that it is objective with minimal reliance on subjective judgements. The strength of the notional value approach is that it is simple and easy to understand. The weakness of these approaches is that they are not based on input and output data related to the local government sector and therefore are not as accurate or applicable as the other approaches.

A further consideration is the newness of the rate capping regime. This means that the full effects of the regime on council productivity and hence efficiency are not yet fully revealed. This implies judgement needs to be exercised in setting and implementing the efficiency factor.

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5 In our water pricing function we impose an efficiency factor of between 1–2 per cent and for tow trucks the efficiency factor has been as low as 0.5 per cent.

6 The regulatory criteria are objectivity, accuracy, applicability, defendable and cost effectiveness.

Other matters affecting efficiency

A study of efficiency in New South Wales councils, found that population levels had a positive effect on a council's technical efficiency.[7] This means the higher the population of a council, the greater the positive influence on efficiency.

The small rural council group in Victoria has the lowest average population and population has fallen by an average of -0.5 per cent per year over the period 2011 to 2016. All other groups have higher and increasing populations. Further, our consultant's benchmarking results showed that a relatively high percentage of small rural councils (37 per cent) are fully technically efficient relative to other councils. This indicates that a number of small rural councils have adopted practices to overcome the disadvantage of low and declining populations to achieve full technical efficiency.

Usefulness of this study beyond the estimation of an efficiency factor

This study has provided information that can be further developed for benchmarking analysis. We recognise that there are differences between councils that may make comparisons difficult. However, comparing the performance of businesses in other sectors is not uncommon. For example we:

- benchmark productivity trends of Victorian water businesses against other Australian water utilities
- measure the performance of Victorian water businesses annually against a series of service standards
- measure compliance performance of Victorian energy retailers against regulatory requirements
- will measure outcomes for the local government sector under the Fair Go Rates system (first report to be released in 2018).

We undertake these activities to encourage businesses to improve their performance and to allow businesses to develop a greater understanding of the factors that affect performance. In these exercises businesses are generally named so participants can identify those that are performing better and learn from them.

However, how we use the information generated through the productivity study to compare performance in the local government context will require greater thought and analysis. We intend to explore this further with the working group.

Next steps

We seek stakeholder feedback on any of the matters discussed in or related to this paper. Including but not limited to productivity trends and benchmarking in the sector and approaches to set an efficiency factor and choosing an approach to set the efficiency factor. Your feedback will help inform our draft report which will recommend an approach to setting the efficiency factor.

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[7] Drew, Joseph, Michael Kortt, and Brian Dollery. *"What determines efficiency in local government? A DEA analysis of NSW local government." Economic Papers: A journal of applied economics and policy 34.4* (2015): 243–256.

Stakeholder feedback should be emailed to us (localgovernment@esc.vic.gov.au) by 13 October 2017.

We will meet with the working group to discuss any feedback before finalising our approach. We will release our draft report with our recommended approach to setting the efficiency factor for comment by December 2017 and our final report on the recommended approach to setting the efficiency factor by February 2018.

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1. Introduction

The local government sector in Victoria comprises 79 councils. These councils provide a range of services, facilities and infrastructure to ratepayers and the broader community, with the objective of promoting the social, economic and environmental viability and sustainability of their municipality.

However, every council provides a slightly different range of services, facilities and infrastructure. This is influenced by its community's preferences, but also reflects the diversity of size, population, level of urbanisation, demographics and geography of each council. These factors influence what councils do, what level of service they provide, and the cost of doing so. More detail on differences between councils can be found in appendix A.

In 2015, the Victorian Government introduced the Fair Go Rates system which caps the annual amount that councils can increase their general rates without seeking approval. Across the sector, rates represent the source of more than 50 per cent of funds for most councils however, large differences exist between individual councils. The Fair Go Rates system confers on the commission a number of roles including advising the Minister for Local Government (the minister) on the annual rate cap and assessing council applications for a higher cap.

Why are we undertaking a productivity study?

In September 2015 we issued our final report on the local government rate capping and variation framework.[8] We advised the minister that the rate cap should take into account changes in the Consumer Prices Index (CPI) and the Wages Prices Index (WPI) and include an efficiency factor. The efficiency factor has the effect of reducing the rate cap and hence the amount of revenue collected from rates.

Details on how the rate cap is set and compliance with the rate cap can be found in appendix B.

The purpose of the efficiency factor is to create incentives to operate more efficiently and ensure that efficiency gains are shared with ratepayers in the form of lower rates.

The report noted that:[9]

> *The efficiency factor should initially be set at zero in 2016–17 and increase by 0.05 percentage points each year from 2017–18. The Commission will undertake a detailed productivity analysis of the sector to assess the appropriate long–term rate for the efficiency factor.*

Incorporating an efficiency factor into pricing formulas is a common way of incentivising service providers to pursue efficiencies in their operations and pass them on to customers. Efficiency factors are commonly used in infrastructure pricing decisions (for example, we use an efficiency factor when determining prices for Victorian water businesses) and the Independent Pricing and Regulatory Tribunal (IPART) includes an efficiency factor in its rate peg formula for councils in New South Wales.

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8 Essential Services Commission 2015, *A Blueprint for Change, Local Government Rate Capping & Variation Framework Review* — Final Report, September.

9 ibid., p. 20.

Under section 185D of the *Local Government Act 1989*, the minister sets the average rate cap based on the change to CPI over the financial year to which the cap relates, plus or minus any adjustments.

Each year since 2016–17, pursuant to section 185D (3)(a) of the Act, the minister has asked the commission for advice on setting the level of the average rate cap.[10] Consistent with the broad approach developed through the rate capping review our advice both years incorporated an efficiency factor. We recommended to the minister that the efficiency factor be set at zero for the year 2016–17 and 0.05 per cent for the year 2017–18.[11]

For both 2016–17 and 2017–18, the minister adopted an average rate cap that was consistent with forecast CPI with no other adjustments.

We will be asked by the minister annually for our advice on an appropriate rate cap. Our approach will be to continue to include an efficiency factor which will be informed by the outcomes of this productivity study. To help inform the efficiency factor included in the rate cap formula, we have commissioned a range of work on efficiency in the local government sector and more generally across Australia. This work is summarised in this consultation paper.

Measuring productivity

We engaged Predictive Analytics Group and Deloitte Access Economics to help us generate productivity trends and a possible methodology to calculate the efficiency factor. The findings of their reports are discussed in this paper.

In its simplest form, productivity is the ratio of outputs to inputs used. The more outputs that a service provider is able to produce using a fixed set of inputs, the greater its productivity. Similarly, the less inputs needed to produce a given level of output, the greater its productivity.

Efficiency on the other hand can be defined as the degree to which the observed use of inputs to produce outputs matches the optimal use of inputs to produce outputs.

Total factor productivity (TFP) (also sometimes referred to as multifactor productivity) incorporates all inputs and all outputs in a single measure. On the other hand partial productivity measures consider just a subset of inputs or outputs.

While productivity is relatively easy to measure for a business or sector that manufactures a small number of products, it is more difficult in the case of local government where:

- councils provide numerous outputs (services). Although all Victorian councils provide the same set of basic services, at the margins councils provide different services, and to different standards
- geographic and demographic factors play a role in determining the cost (inputs) of providing services which influence productivity.

There are a number of different ways of measuring productivity. Our consultants have used well established methods and the best available data to estimate productivity trends for the sector. This is the first time that we know about that productivity trends for the Victorian local government sector have been estimated using a total factor productivity approach.

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[10] Detail on our advice on the rate cap and compliance can be found in appendix B.
[11] Our advice can be found on our website (www.esc.vic.gov.au).

Technical terms used in this report

This report contains a number of technical terms. To help readers understand these terms we have included a comprehensive glossary.

Productivity study working group

Early in 2017, we established the productivity study working group (the working group) comprised of a representative from Local Government Victoria, Municipal Association of Victorian, the Victorian Local Governance Association and the Local Government Professional organization and 15 staff from different councils and members of the commission's local government team.

The main purposes of the working group are to:

- provide relevant data and information
- provide insights and understanding about what is driving productivity trends across the Victorian local government sector
- test preliminary findings of the study
- provide advice on how outcomes are best communicated to the sector.

The working group has discussed the approaches for measuring productivity, including data envelopment analysis and proxy measures, and broader measures such as the local government performance reporting framework. They have raised issues and comments relating to the different approaches. The working group has also discussed the purpose of the efficiency factor and proposed criteria to select between the different available approaches.

Purpose of this report

The purpose of this consultation paper is to facilitate feedback from the sector and interested parties on a study undertaken by the commission to examine the underlying productivity trends in local government and the options identified to estimate an efficiency factor.

Structure of this paper

This paper is structured as follows:

Chapter 1 — Introduction

Chapter 2 — Productivity trends and benchmarking in the Victorian local government sector

Chapter 3 — Approaches to set the efficiency factor

Chapter 4 — Choosing an approach

Stakeholder feedback

We seek stakeholder feedback on any of the matters discussed in or related to this paper. Including but not limited to productivity trends and benchmarking in the sector and approaches to set an efficiency factor and choosing an approach to set the efficiency factor.

Responding to this paper

Submissions to this consultation paper close on 13 October 2017.

Please email submissions to localgovernment@esc.vic.gov.au with subject title: 'Submission to Productivity Study: Victorian Local Government'.

You may also send submissions via mail, marked:

> Attention: Local Government Division
> Essential Services Commission
> Level 37, 2 Lonsdale Street
> Melbourne VIC 3000

Any questions regarding this consultation paper may be directed to:

> Merryn Wilson
> Project Manager, Local Government Division
> 03 9032 1300.

Publication of submissions

To promote transparency, we will make all submissions publicly available on our website unless clearly instructed otherwise in the submission.

If your submission contains confidential or commercially sensitive information that you do not wish to be disclosed publicly, please clearly identify the specific information in the submission.

Next steps

We will meet with the productivity study working group to discuss any feedback before finalising our approach. We will release our draft report with our recommended approach to setting the efficiency factor for comment by December 2017 and our final report on the recommended approach to setting the efficiency factor by February 2018.

2. Productivity trends and benchmarking in the local government sector

We appointed Predictive Analytics Group to help us investigate possible ways of measuring productivity trends to inform the efficiency factor. A copy of their report Predictive Analytics Group, 2017, *Local Government — measuring productivity using a direct method,* June 2017 is attached to this report.

Measuring productivity using data envelopment analysis

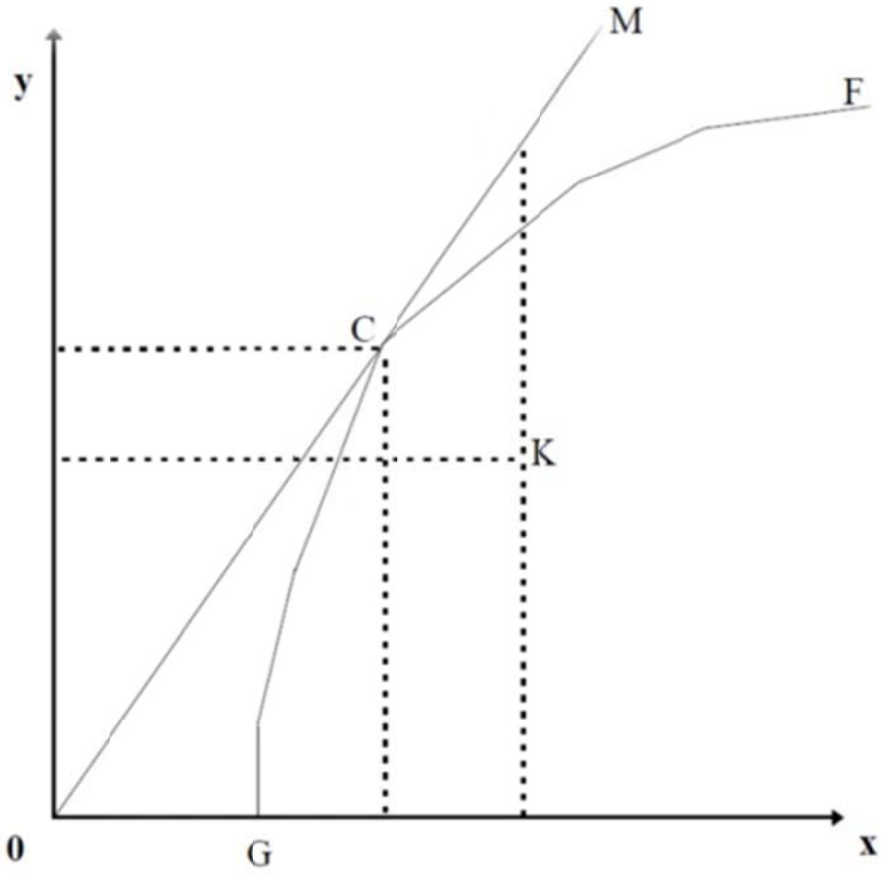
Predictive Analytics Group used a method called data envelopment analysis to estimate productivity trends for the local government sector and calculate an efficiency factor (described in Chapter 3). Data envelopment analysis is a well–established method to estimate total factor productivity. It has been used to estimate productivity levels in local government in other jurisdictions.

Data envelopment analysis uses inputs and outputs related to each council to calculate a production frontier using linear programming.[12] The frontier represents full technical efficiency — the point at which the highest output occurs given specified inputs or the point at which the lowest amount of inputs are used to produce a specified quantity of output. Importantly though, it is a relative measure. In this case it measures a council's efficiency against the other measured councils, and not a hypothetical 'perfect council'. Just because a council is on the frontier does not mean that (potentially large) technical efficiency gains can't be made. However, the further from the frontier the less technically efficient a council is.

Figure 2.1 shows a single input and output production frontier.

[12] Linear programming is a mathematical technique to achieve the highest outcomes (referred to as technical efficiency) given a range of variables.

Figure 2.1 Single input and output production frontiers



Source: Predictive Analytics Group

The production frontier is the minimum amount of input (x axis) required to produce a certain amount of output (y axis) of a given quality. Two frontiers are shown in the figure above. The straight line frontier (O to M) is based on constant returns to scale (CRS), which assumes that a one unit change in input results in a one unit change in output. The curved frontier (G to F) represents variable returns to scale (VRS), which assumes that output does not change in direct proportion with input. Predictive Analytics Group recommended the use of the VRS (curved) frontier to estimate technical efficiencies because it is more realistic to expect the relationship between inputs and outputs is not fixed.

Full technical efficiency occurs at points on either the CRS or VRS frontiers. For example point C represents full technical efficiency (for that group) under both CRS and VRS. A local government's efficiency relative to full technical efficiency is estimated based on its distance from the frontier. Technical efficiency scores range between zero and one — where a score of one represents full technical efficiency and an entity scoring one is on the frontier. A score less than one indicates that the entity is not fully technically efficient and not on the frontier. For example, point K is not on either frontier. To move toward the frontier it would need to reduce the amount of input for a specified level of output, or increase output for that level of input. Another feature of data envelopment analysis is even if a local government is judged to be fully efficient, it is still possible to become more efficient and push the frontier forward. Technical efficiency is a key component used in the estimation of productivity changes and the efficiency factor.

Malmquist index

The results from the data envelopment analysis can be used to measure:

- technical efficiency change — this represents a movement from or toward the existing frontier. It effectively represents the change in productivity from one year to the next with existing technologies
- technological change — represents a change in the ability of a local government to convert a given amount of inputs into a given amount of outputs. It is represented by a shift in the position of the production frontier from one year to the next, through the best local governments getting better or worse. It can be thought of as the impact of the adoption of new technologies.

These two components are multiplied together to form the Malmquist index. From the Malmquist index, total factor productivity change is calculated as set out in box 2.1.

Box 2.1 Calculating total factor productivity change

TFPC (%) = (Malmquist index -1) x 100

Input — output combinations

Predictive Analytics Group proposed five possible input—output combinations to subject to data envelopment analysis for the purpose of calculating technical efficiency and total factor productivity change. The combinations are described in table 2.1. Predictive Analytics Group noted in its report that a robust model should encapsulate the broadest possible range of inputs and outputs which are common to all local governments and account for the full scale of their operations.

The outputs used as variables in the analysis are the key council outputs, and the main influences on costs and productivity. Good modelling practice indicates that there can be risks of including larger numbers of marginal variables, and this may result in double counting and errors in the analysis. [13] Hence the number of outputs is relatively small.

Predictive Analytics Group said in its report that a study by Drew and Dollery (2014) found Australian local governments generally provide services to property.[14] Hence the number of households the number of businesses and tonnes of waste collected (in model 3 only) were used as outputs in the models. The length of roads is also used as an output because road maintenance is a major council function. The inputs used in the modelling represent the major expenses councils make to deliver services. Drew and Dollery (2014) noted that local governments have begun to deliver other functions, but these emerging services are still relatively insignificant when compared to the traditional services property remit of Australian local governments. They also found that the number of households and businesses is more representative of the output of Victorian local governments.

Predictive Analytics Group noted that the literature supports Model 1 as the most comprehensive and succinct (based on Drew, Kortt and Dollery 2015)[15], as it adequately covers all major areas of inputs and outputs without double counting (for example, including population would result in an overlap with households).

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[13] Marginal variables account for a small part of council operations and may have relatively little effect on the efficiency score

[14] Drew, Joseph, and Brian Dollery. "Keeping It In House: Households Versus Population as Alternative Proxies for Local Government Output. "Australian Journal of Public Administration 73.2 (2014): 235–246.

[15] Drew, Joseph, Michael Kortt, and Brian Dollery, 2015, "*What determines efficiency in local government? A DEA analysis of NSW local government." Economic Papers: A journal of applied economics and policy 34.4*.

Table 2.1 Model specifications for data envelopment analysis

Model Number	Inputs	Outputs
1	council staff ($) capital ($)	households, businesses, length of roads (km)
2	council staff (FTE) capital ($)	households, businesses, length of roads (km)
3	council staff ($) capital ($)	households, businesses, length of roads (km), waste collected (tonnes)
4	capital ($) operating expenses (excl. depreciation) ($)	households, businesses, length of roads (km)
5	operating expenses (excl. depreciation) ($) + depreciation ($)	households, businesses, length of roads (km)

Source: Predictive Analytics Group

We believe the models developed by Predictive Analytics Group capture the main inputs used by councils and the outputs produced. The number of households, businesses and length of roads serviced act as proxies for the bundle of services delivered by councils. These outputs are common to all councils and this helps to alleviate the issue of not being able to compare councils because of differences in the types and quality of services delivered.

The working group made a number of observations on the proposed models that were subsequently included by Predictive Analytics Group in its modelling. Including:

- Where services are outsourced, staff costs may not be adequately reflected in models using only council staff. As such, models 4 and 5 include operating costs to address this.
- Depreciation is a more appropriate measure of inputs than capital expenditure in a period, as capital expenditure can be lumpy and depreciation smooths assets costs over time. Model 5 was introduced to address this.
- Waste data is not reliable and should not be included in the modelling. Waste was only included in model 3 to reflect waste collection is a major council activity.

Other observations were not pursued by us and Predictive Analytics Group because they would have a relatively minor effect on the efficiency score. Including using:

- Household and business numbers may result in some double counting where residential properties also serve as businesses.
- Vacancy rates (from Census data) could assist in adjusting the number of households to more accurately reflect current population size as an input in the modelling.
- The quality of services in the models. Examples of how quality could be measured include road ratings and opening hours for council facilities.

Data

The data used in the models was mainly sourced from annual Victorian council returns to the Victoria Grants Commission over the period 2010–11 to 2015–16. Sustainability Victoria also provided data over the same period for waste collected.[16] Rate capping came into effect in the 2016–17 rating year and so the effect of rate capping on council productivity is not reflected in Predictive Analytics Group's analysis.

Single group or multiple group analysis

Predictive Analytics Group calculated the Malmquist index (which in turn is used to calculate total factor productivity change) using single group and multiple group analysis (see appendix E for a list of council groupings).

Single group analysis involves constructing a single production frontier, where a council is compared against all councils for the purpose of calculating its relative technical efficiency. An average is taken of all the individual council technical efficiency's (calculated from the same frontier) to measure the average level of technical efficiencies in the Victorian local government sector.

Multiple group analysis involves constructing an individual production frontier for each council grouping, where councils are only compared to similar councils (from the same grouping) for the purpose of calculating a council's relative technical efficiency. Following this an average is taken of all 79 individual council technical efficiency scores to measure the average level of technical efficiency.

Productivity trends in the local government sector

Predictive Analytics Group generated productivity trends for the sector by calculating the average Malmquist index for the sector over the period 2010–11 to 2015–16.[17] A Malmquist index greater than one indicates total factor productivity is improving and less than one indicates total factor productivity is declining. Predictive Analytics Group used single group and multiple group analysis in the calculations.

[16] Waste figures are general waste only and do not include recyclables or green waste.
[17] More detail on calculating of the Malmquist Index can be found in Predictive Analytics Group's report.

Table 2.2 Summary of Malmquist index and total factor productivity change (TFPC) 2010–11 to 2015–16

Model	Average Malmquist index Single group analysis	Average TFPC Single group analysis (%)	Average Malmquist index Single group analysis	AverageTFPC Multiple group Analysis (%)
1	0.993	-0.7	0.993	-0.7
2	0.994	-0.6	0.994	-0.6
3	0.993	-0.7	0.993	-0.7
4	0.984	-1.6	0.985	-1.5.
5	0.977	-2.3	0.976	-2.4

Source: Predictive Analytics Group. The Malmquist index is calculated by multiplying technical efficiency change and technological change together.

The results in table 2.2 show that the total factor productivity across the local government sector declined from 2010–11 to 2015–16. A Malmquist index less than one means a corresponding negative change in total factor productivity. The results are consistent for all models, though the decline is greater under models 4 and 5. This is regardless of whether single group or multiple group analysis is used.

Predictive Analytics Group found that the decreases in overall productivity are due to reductions in technological change. While most of the models show that technical efficiency change increased slightly, this is more than outweighed by falls in technological change.

In other words, historically councils have improved their efficiency using existing technology (moving closer to the frontier) but their efficiency from utilising new technology declined by a greater amount (a decrease in technological change means the whole frontier has contracted). This results in a decline in overall performance. However, it is important to note that this analysis does not take into account the effects of rate capping.

Predictive Analytics Group also prepared Malmquist index trends for each council group under each model and compared these with trends for the whole of sector. Predictive Analytics Group generally found that the council groups followed the same trend as the whole of sector. Further, there was generally little difference in the level of the Malmquist index between groups. This indicates that any differences between councils are not driven by whether a council is in a particular group. Rather there are high and low performing councils in each group. The results can be seen graphically in Predictive Analytics Group's report.

We propose to periodically update (for example every four years) the analysis to understand how productivity is trending across the council groups and sector under the Fair Go Rates system.

Limitations of the approach

Predictive Analytics Group highlighted some limitations of the analytical framework used to calculate productivity trends. In summary these were:

- Data envelopment analysis is a relative measure. It measures a council's efficiency against other councils not a hypothetical 'perfect entity'.
- There may be some inputs that are not accounted for. For example a council may use volunteers to deliver some services.
- There may be a delay between when an input is measured and when the resulting output is recorded. This may be addressed by measuring productivity over a longer period of time to 'smooth' out this effect.
- There may be some influences on technical efficiency and productivity that are outside a council's control.
- The Victoria Grants Commission data used in the analysis is unaudited.

Implications for the efficiency factor

The data envelopment analysis set out in table 2.2 (Malmquist index) shows that under both the single and multiple group approaches, total factor productivity in the Victorian local government sector has **fallen** by a total of 1 to 2 per cent over the period 2010–11 to 2015–16.

In contrast, productivity data from the ABS (see table 3.1) shows that total factor productivity across the broader economy has **increased** roughly 1 per cent (0.17 per cent compounded over 5 years) from 2010–11 to 2015–16.

It would seem productivity in the local government sector is falling behind and going in a different direction to that of the broader economy.

Benchmarking

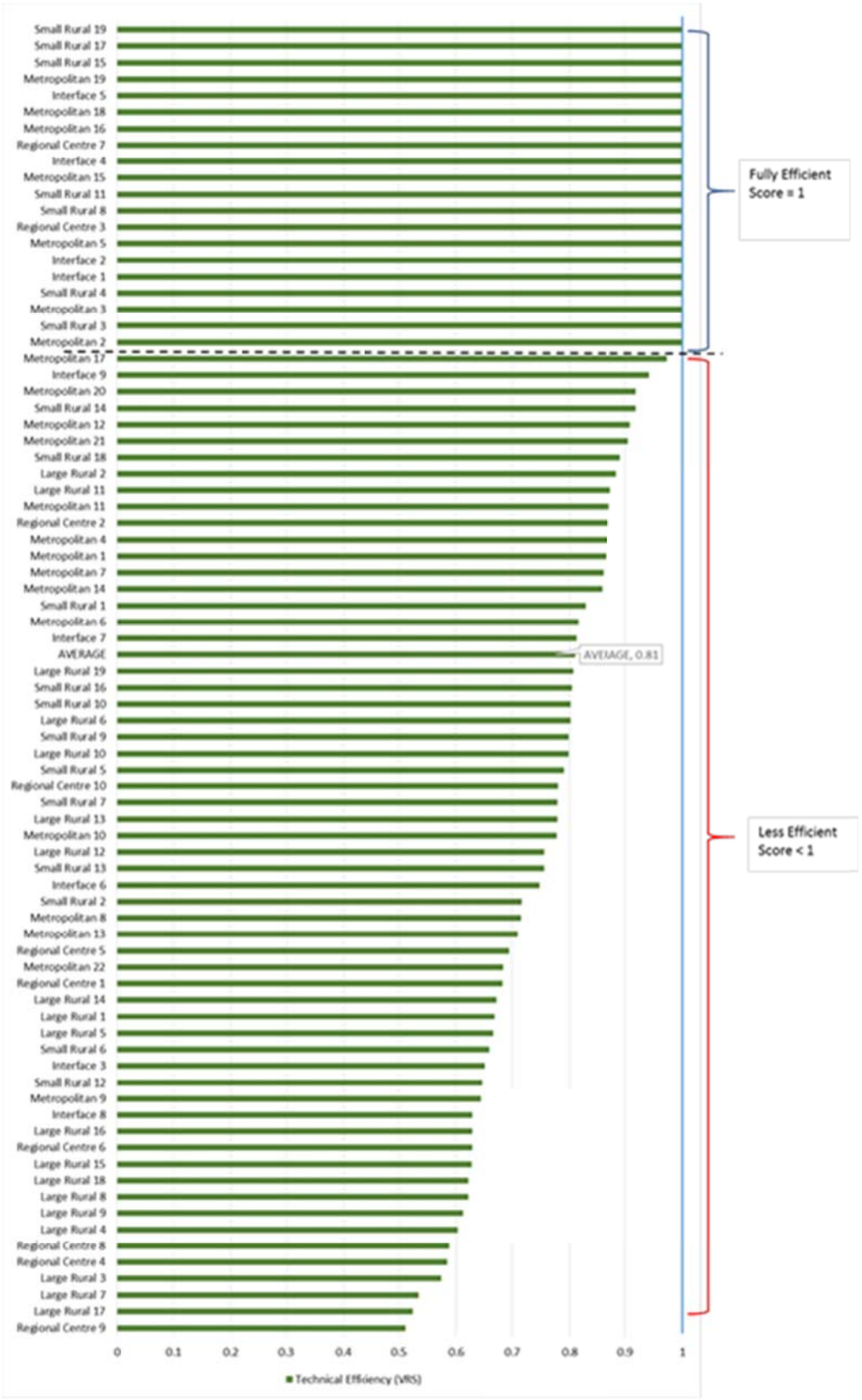
Predictive Analytics Group's analysis also enabled us to benchmark council's (or council groups) technical efficiency. We recognise that there are differences between councils that may make comparisons difficult. However, we compare the performance of businesses in other sectors we regulate. For example we:

- benchmark productivity trends of Victorian water businesses against other Australian water utilities
- measure the performance of Victorian water businesses annually against a series of service standards
- measure compliance performance of Victorian energy retailers against regulatory requirements
- will measure outcomes for the local government sector under the Fair Go Rates system (first report to be released in 2018).

We undertake these activities to encourage businesses to improve their performance and to allow businesses to develop a greater understanding of the factors that affect performance. In these exercises businesses are generally named so that participants can identify those that are performing better and learn from them.

Figure 2.2 shows an example of benchmarking technical efficiency results for all councils using model 1, where councils are considered as a single group and results are measured using the variable returns to scale frontier. It can be seen that about one–quarter of councils (20) are on the productivity frontier and hence considered to be 'fully technically efficient' relative to their peers. The lowest efficiency score is 0.51 and the mean technical efficiency score of all councils under this framework is 0.81. The mean is well above 0.5, this indicates that councils are generally performing well relative to each other.

Figure 2.2 **Data envelopment analysis (VRS) Technical Efficiencies for Model 1 (Single Group Analysis) in 2015–16 (Predictive Analytics Group to provide clearer image)**



Source: Predictive Analytics Group

Table 2.3 shows the number of councils from each group that are considered to be fully efficient in 2015–16 using model 1 (Predictive Analytics Group's preferred model).

Table 2.3 Number and percentage of councils that are fully technically efficient within each council group based on model 1

Council group	Number fully technically efficient	Percentage of total councils in group (%)
Small rural	7	37
Large rural	0	0
Regional centre	2	20
Interface	4	44
Metropolitan	7	32

The results in this example show that each group (except large rural) has councils that are fully technically efficient. This indicates that group characteristics may not alone influence efficiency. This is consistent with Predictive Analytics Group's earlier finding that within each group there are high and low performing councils.

It is important to note that technical efficiency scores vary according to the model used and whether they are based on single or multiple group analysis.

Table 2.4 shows the average technical efficiency scores for the sector under each model and grouping scenarios for 2015–16.

The modelling showed that technical efficiency scores were influenced by whether councils are measured against all other 78 councils (single group) or only councils within their group (multiple group).

When councils are measured against those in their grouping (multiple groups), the technical efficiency score is higher. This is likely to be because there are relatively fewer differences between councils in the same group.

Further, it is highly likely that a council's technical efficiency score will be different from year to year. Technical efficiency is dynamic; a council that is deemed fully efficient in one year may not be fully efficient in another year and vice versa.

Table 2.4 Technical efficiencies — 2015–16

Model number	Single group mean technical efficiency (VRS)	Multiple group mean technical efficiency (VRS)
1	0.81	0.94
2	0.79	0.94
3	0.83	0.96
4	0.81	0.96
5	0.82	0.96

Source: Predictive Analytics Group

We may also consider using benchmarking as one of a suite of approaches to measure the outcomes of the Fair Go Rates system on councils and the sector as a whole.

We recognise that quantitative methods such as data envelopment analysis may not give a full understanding of the factors that drive efficiency. Therefore, to better understand benchmarking results, we could also undertake a series of case–studies. These studies could collect qualitative information that will give tangible examples of what good practices and organisational cultures that contribute to improved efficiency look like. However, the use of benchmarking in the local government sector requires greater thought and analysis and we intend to explore the concept with the working group.

3. Approaches to setting the efficiency factor

The commission's objective is to set an efficiency factor that reasonably estimates the productivity improvements that should be achievable by councils in the coming financial year.

In this chapter we propose four approaches to calculate the efficiency factor. We have considered:

- a small, notional factor of 0.05 per cent cumulatively. In other words, each year add 0.05 per cent to the previous year's efficiency factor, but capped in the longer term[18]
- a proxy value drawn from historic Australian industry productivity data collected and calculated by the ABS. If a proxy is used our preference is for the proxy to be based on a value added multifactor measure that takes an average of 16 Australian industries
- a value calculated using data from the data envelopment analysis described in chapter 2. Our consultants have identified a range of values from 0.01 to 0.09 per cent
- using performance data from the local government performance reporting framework to inform the efficiency factor.

Notional efficiency factor — 0.05 per cent

During our review in 2015 to establish the framework, we raised our intention to include an efficiency factor in the rate capping formula. The purpose of the efficiency factor is to help ensure efforts by councils to generate savings (in excess of the rate cap) are shared with ratepayers. This can take the form of lower rates. To allow for the fact that the framework was new and councils would have 'locked in' costs under some contracts; we set the initial efficiency factor at zero, increasing by 0.05 percentage points each year.

We chose 0.05 per cent as a starting point because it seemed unlikely that a council's financial viability would be threatened by an efficiency factor that low. And if any council's viability was under pressure, it was more likely to be the result of some other factor that could be addressed through the rate cap variation process.

We acknowledged that the study could suggest that the factor be different from the 0.05 per cent originally proposed. If we adopt this approach we consider it would be reasonable to increase the efficiency factor up to a point where it would be capped. We said that it was never our intention to increase the efficiency factor indefinitely, and we had not formed a view about whether there was a time beyond which the efficiency factor would not be required. We added that four yearly reviews should consider whether changes need to be made to how efficiency is addressed in the cap.[19]

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[18] Consistent with the approach in Essential Services Commission 2015*, A Blueprint for Change, Local Government Rates Capping & Variation Framework Review — Final Report Volume I*, September.

[19] Essential Services Commission, 2015, *A blueprint for change local government rate capping and variation framework review — final report,* September.

Proxy measures

We appointed Deloitte Access Economics (Deloitte) to help us investigate possible proxy measures that could be used to inform the efficiency factor. A copy of Deloitte's report *Deloitte Access Economics, 2017, Indirect Local Government Productivity Measurement, Essential Services Commission, April* is attached to this report.

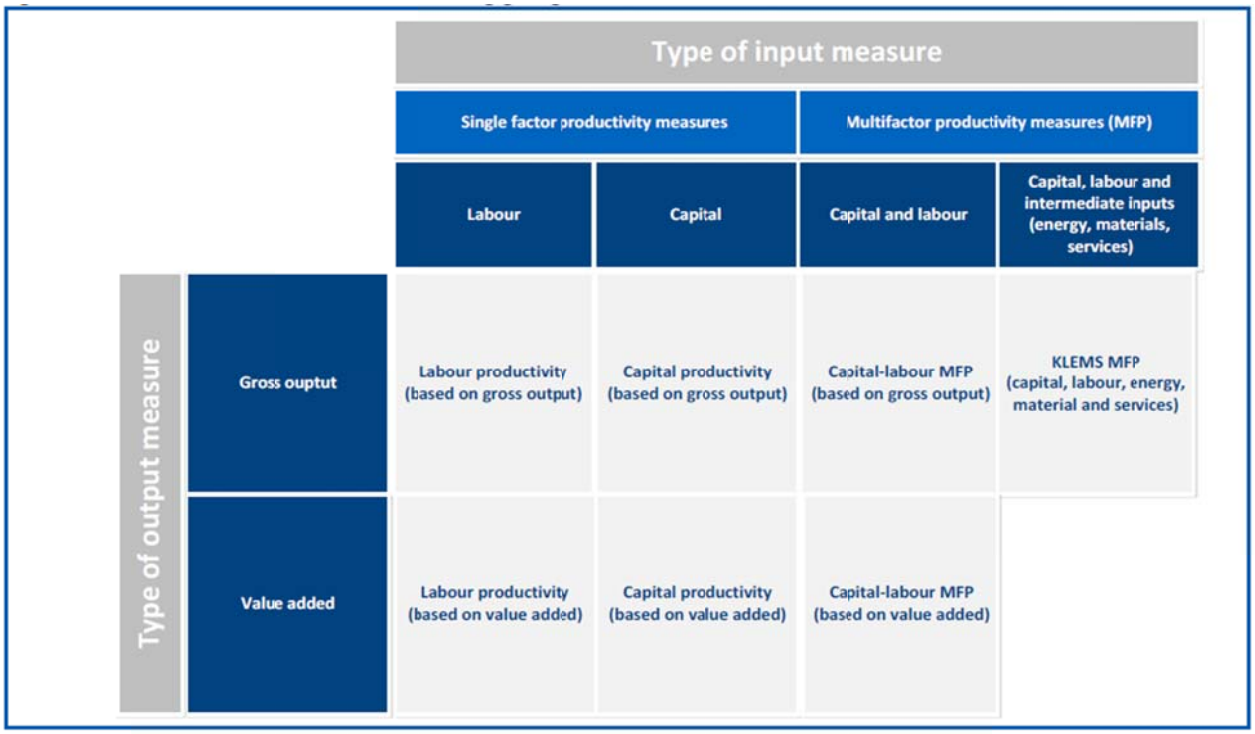
A proxy is defined as a "substitute for another". In this context, a proxy productivity measure is a substitute for measuring productivity more directly by using inputs and outputs attributable to the sector. The effectiveness of the proxy is determined by how closely it reflects the productivity of an 'average' council or the sector.

The theory behind the use of a proxy measure is that it would be reasonable to expect councils to be able to achieve productivity improvements in line with other sectors of the economy.

Analysis

Deloitte based its analysis on seven productivity measures contained in the Organisation for Economic Co–operation and Development (OECD) classification for aggregate productivity measures.[20] Refer to figure 3.1 for the OECD's classification.

Figure 3.1 OECD Classification



Source: Deloitte

[20] An aggregate measure is the measure of productivity in an industry or for a country.

The measures are classified as either value added or gross output. Gross output measures the total output of an industry including the production of intermediate inputs (goods and services sold for the production of other goods and services rather than for final consumption). The value added approach measures total (gross) output less intermediate inputs. A further distinction between the measures is whether they are single input (labour or capital) or multifactor (capital and labour).[21]

The ABS collects data for each measure at a national level for 16 of the 19 market sector Australian industry divisions.[22] It also compiles data that takes an average of the 16 market sector industries to calculate an 'economy wide' estimate of productivity. The ABS data can be used to measure changes in productivity (percentage terms) of a particular industry sector on an annual basis or over time.

Deloitte gave a number of reasons supporting the use of ABS data to estimate productivity including:

- the data is publicly available at no cost
- a long time series is available (data was first collected in 1996)
- data is updated annually
- data is indexed to allow direct comparison between years and measures
- data is held to a high standard under the ABS data quality framework.

On this basis, we consider that if a proxy measure is used, it is reasonable to base it on the productivity data collected by the ABS.

However, Deloitte advised that there are a number of issues that need to be addressed before deciding on an appropriate measure.

The sections below summarise the issues and suggest a preferred position for a proxy measure.

Which sector(s) to use?

The ABS data set does not include productivity data for three non–market industries which are likely to best reflect the local government sector. These are public administration and safety, education and training, and health care and social assistance.[23] This means that options for the proxy could include using a subset of the 'next best' industries with activities that most closely reflect council activities or using an average of all 16 market sector industries as IPART does. A description of IPART's approach can be found in appendix C.

Deloitte considered that the three industry divisions most closely reflecting the activities of local government are administrative and support services, arts and recreation services and transport, and postal and warehousing industries. Definitions for each industry division can be found in appendix D. Using these industries, Deloitte constructed a weighted index using weights for each industry division based on a breakdown of average Victorian local government expenditure for 2014–15. This data is held by the ABS.

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21 KLEMS also takes into account energy, materials and services.

22 The Australian and New Zealand Standard Industrial Classification (ANZSIC) classifies each of the 16 divisions. A definition of each division is contained in appendix D.

23 Non–market services cover those services provided to the community as a whole free of charge, or to individual consumers either free of charge or at a fee which is well below 50 per cent of production costs. Source: OECD.

Our analysis of the definitions shows that the divisions selected by Deloitte contain some activities undertaken by local government. However, they do not completely reflect the activities of local government.

Both options contain industries that undertake activities not related to local government — the 16 market sector industry average more so. However, the weights used for the three industry index are subjective and this measure may be more volatile over time. So on balance if a proxy measure were to be used we consider a measure based on an average of the 16 market sector ANZSIC divisions would be appropriate.

Table 3.1 compares results over different timeframes for an index of three industries and 16 industries, based on value added multifactor productivity.

Table 3.1 Average value added multifactor productivity over different timeframes

Industries	5 year average productivity since 2010–11 (%)	10 year average productivity since 2005–06 (%)	15 year average productivity since 2000–01 (%)	20 year average productivity since 1995–96 (%)
Weighted index of 3 industry divisions	-0.95	-0.90	-0.45	-0.46
Average of 16 industry divisions	0.17	-0.16	0.13	0.47

Source: Deloitte

Timeframe for measurement

The ABS has collected productivity data for each measure since 1996. This gives flexibility to choose a longer or shorter timeframe to measure productivity changes. Deloitte recommended a timeframe of between 5–10 years. It considered timeframes of 15 years or longer could reflect changes in productivity due to historic factors that are no longer relevant. On the other hand, shorter timeframes may be more volatile and include the influence of one off events.

We consider that Deloitte's assessment is reasonable. If a proxy measure were to be used, our recommendation would be to use a five year timeframe because it reduces the risk of including the effects of obsolete technologies and practices.

Single input measures (labour or capital) or multifactor measures

Deloitte considered that single input measures or multifactor measures were all valid. But it concluded that multifactor measures may be more suitable for the local government sector. This is because local government uses a mix of capital and labour to deliver services and these measures are more comprehensive and reflect the changing mix of labour and capital over time.

We considered Deloitte's assessment is reasonable and if a proxy measure were to be used then the measure would be based on multifactor productivity.

Gross output or value added measures

Deloitte considered there was little difference between gross output and value added measures at an aggregate level, with differences more pronounced at an industry level.

Deloitte concluded that gross output is difficult to define in the local government context. And the inclusion of intermediate goods may result in double counting inputs and outputs. On this basis it recommended using a value added approach.

Furthermore, the ABS discontinued the market sector gross output measure of multifactor productivity in 2011.

After taking this, and Deloitte's conclusion into account, we are satisfied that using a value added measure is reasonable.

Negative values

Table 3.2 shows that negative average changes in productivity are possible. This raises the issue of how to treat these results.

Deloitte advised that there are three possible options to deal with negative results. These are:

1. add the negative result to the rate cap (which has the effect of increasing the rate cap)
2. set the efficiency factor to zero when the productivity change is negative and apply any positive result fully— IPART does this
3. set the efficiency factor to zero when the productivity change is negative. Then make an adjustment when the average productivity change is positive so the local government sector is not required to make greater efficiencies than elsewhere in the economy.[24]

We propose to adopt the second option because it is relatively simple and consistent with IPART's approach.

Recommended proxy measure

Based on Deloitte's finding and our review, we consider that taking a five year average of a value added multifactor approach based on 16 industries is a reasonable proxy measure of local government productivity change.

Calculating the efficiency factor using the outputs from data envelopment analysis

Information from the data envelopment analysis undertaken by Predictive Analytics Group (described in chapter 2) can be used to calculate efficiency factors using the formula in box 3.1.

[24] Full details of this approach are contained in appendix B of Deloitte's report.

Box 3.1 Calculating the efficiency factor using the outputs from data envelopment analysis

Efficiency factor = TFPC + $((1+p\ (1-TE))^{1/t} - 1) \times 100$

Where TFPC = Total Factor Productivity Change

TE = Technical Efficiency

p = the required efficiency gain in percentage terms

t = the time (in years) that the efficiency gain is required

The formula seeks to move the sector toward full efficiency (the frontier). The calculation takes into account an entity's (or sector's) latest technical efficiency score and its historical total factor productivity change. The formula also takes into account the size of the efficiency gain and the timeframe for achieving the gain.

Key considerations that need to be made if using this approach are:

- what a reasonable efficiency gain would be
- what timeframe should the gain be achieved over
- whether total factor productivity change and technical efficiency should be calculated using single or multiple group analysis.

The first two points would require a judgement to be made by the commission. As can be seen in Chapter 2, multiple group analysis gives slightly higher technical efficiency scores. The implication of this is, all else being equal, the efficiency factor is lower.

Efficiency factors were calculated using each of the five model specifications under multiple group analysis to provide an indication of the range of possible efficiency factors that could be adopted (refer to table 3.2). In the table the efficiency factor represents the percentage reduction in input costs per year to achieve the required efficiency gain over the specified timeframe. For example a 0.02 efficiency factor implies that councils would need to reduce input costs by 0.02 per cent per year to increase efficiency by 2.5 per cent over five years.

Table 3.2 Indicative efficiency factors using data envelopment analysis results

Required efficiency gain	2.5 %		5.0 %		7.5 %	
Timeframe for efficiency gains (years)	Minimum (%)	Maximum (%)	Minimum (%)	Maximum (%)	Minimum (%)	Maximum (%)
5	0.02	0.03	0.04	0.06	0.06	0.09
10	0.01	0.02	0.02	0.03	0.03	0.05

Source: Predictive Analytics Group. Note: multiple group analysis was used to calculate the variables used in the efficiency factor calculation.

For each combination of required efficiency gain and timeframe to achieve the gain over, a range of efficiency factors were calculated. The range represents different models generating different values for technical efficiency and total factor productivity change. The results in table 3.2 show that there is little difference between the maximum and minimum efficiency factors for each combination.[25] This indicates that the model specification does not have a significant effect on the efficiency factor. The key factors influencing the efficiency factor are the required efficiency gain and the number of years to achieve the gain. As the required efficiency gain increases and the number of years to achieve the gain decreases the efficiency factor increases.

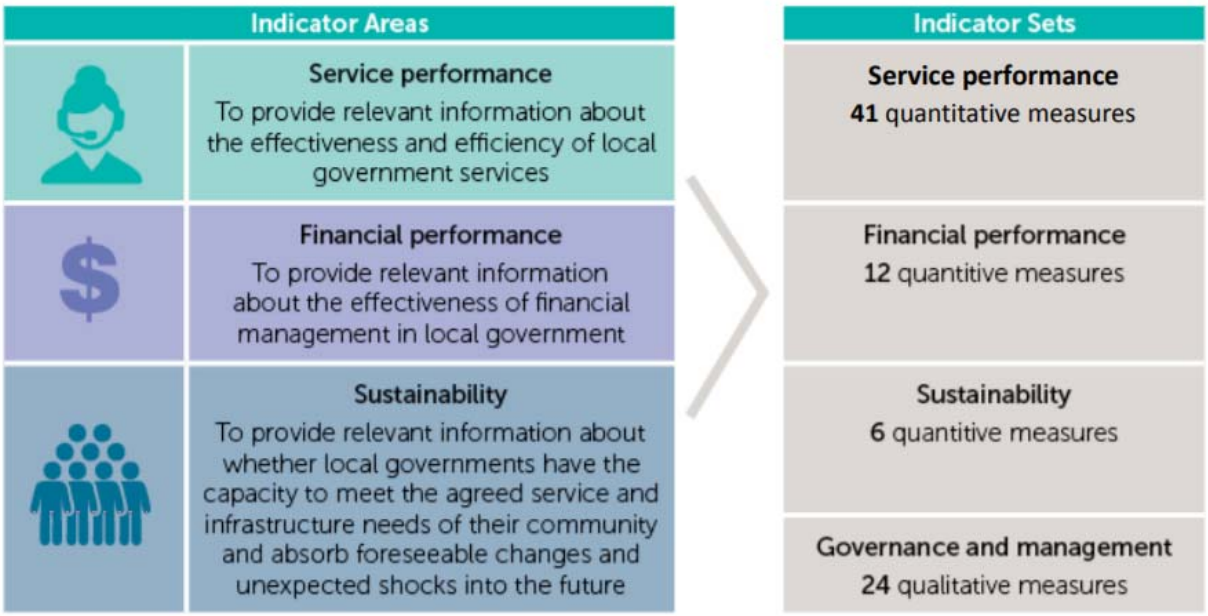
Importantly, the calculation of the efficiency factor using the approach above requires decisions on two elements — the required efficiency gains and the time over which the gains are sought.

Local government performance reporting framework

Another approach to set the efficiency factor could be to use the local government performance reporting framework established in 2014.

The objective of the framework is to provide a consistent and comprehensive way to measure, assess and benchmark the performance of councils across Victoria. The framework constitutes 66 measures on service delivery, financial performance and sustainability. In addition there are 24 qualitative measures to assess council adherence to governance and management best practice. These measures are categorised into four indicator sets across three thematic areas, namely service performance, financial performance and sustainability, as shown in figure 3.2. Councils report the framework outcome indicators and measures within the performance statement in the annual report.

Figure 3.2 Local government performance reporting framework indicators and sets



[25] For each combination of required efficiency gain and timeframe to achieve the gain, different efficiency factors were calculated using each of the different models.

Source: Local Government Better Practice Guide 2016–17, Performance Reporting Framework Indicator Workbook, p. 9.

The commission understands that some councils measure their performance internally through the local government performance reporting framework indicators. While there are merits of this approach in terms of transparency and accountability, the actual emphasis and use of local government performance reporting framework results varies by council.

This local government performance reporting framework data is publicly available, which promotes transparency and accountability regarding council performance and can help identify where there is scope for improvement. This can be particularly important in a local government context as services are rarely subject to competitive pressures (as communities cannot seek services elsewhere) and hence can be difficult to benchmark.

The local government performance reporting framework allows comparisons between similar councils and tracking performance over time.

However, one feature of the local government performance reporting framework is that comparisons are largely based on 'partial' productivity measures: factors that only examine one element of service provision — for example the unit cost of garbage bin collection is one such indicator. It is not really possible to understand overall council performance or efficiency from the local government performance reporting framework system. In addition, not all individual unit cost measures can be readily incorporated into the rate cap formula without further work. As such we have not been able to calculate an efficiency factor at this stage using this approach.

Summary of results

Table 3.3 sets out the results for each approach. The results range from 0.04 to 0.17 per cent using the three approaches outlined in this paper. Each of these could be considered modest efficiency factors, especially when compared to productivity improvements we require of other sectors. In our water pricing function we impose an efficiency factor of between 1–2 per cent and for tow trucks the efficiency factor has been as low as 0.5 per cent.

Table 3.3 Efficiency factors generated by each approach

Approach	Efficiency factor (%)
Notional	0.05
Proxy[a]	0.17
Data envelopment analysis[b]	0.01-0.09

[a] Latest 5 year average (16 industries) value added multifactor measure. [b] Range of all values in table 3.2.

Of particular note, the range of indicative efficiency factors in table 3.2 from the data envelopment analysis is consistent with the other two results. This indicates that setting required efficiency gains between 2.5 and 7.5 per cent over a 5 to 10 year period is not unreasonable. Noting that the effects of the rate capping regime are not known and are not reflected in the data envelopment analysis.

4. Choosing an approach

In Chapter 3 we described four approaches that could be used to set the efficiency factor. We have considered the suitability of each approach against criteria that reflect good regulatory practice. At its second meeting, the working group generally agreed that the criteria for assessing the different approaches were reasonable.

The criteria are:

- Objectivity — minimal reliance on subjective inputs or arbitrary values
- Accuracy — needs to represent general levels of productivity and productivity change in the local government sector
  - Inputs and outputs need to be measurable and verifiable
- Applicability — aggregate measures must be
  - Meaningful — they are related to the entities goals and provide information that is valuable to policy/decision makers
  - Comprehensive — the measures should capture the most important aspects of an entity's performance
- Defensible — needs to be defendable in a regulatory context
  - Consistent with economic theory
  - Calculated in a transparent and understandable manner. Ideally the measure should be simple to calculate and easy to explain to a broad audience
- Cost effective — needs to ensure the benefits of change outweigh the costs.This is measured by the cost of implementing the approach.

Review of approaches

The results of our review of each approach are set out in table 4.1. Our review measured the degree to which each approach meets the criteria relative to the other approaches. The results range from one to five. For example, an approach rated as five means that relative to other approaches it best meets the criteria. Conversely, an approach rated as one means that relative to other approaches it least meets the criteria. If two or more approaches have the same score that means that they meet the criteria equally.

Table 4.1 Assessment of each approach against criteria

Criteria	Notional 0.05	Proxy	Data envelopment analysis	LGPRF
Objectivity	1	5	4	5
Accuracy	1	1	5	2
Applicability -Meaningful -Comprehensive	 1 1	 1 1	 5 5	 3 3
Defendable -Consistent with economic theory -Simple and understandable	 5 5	 5 3	 5 1	 1 3
Cost Effective	5	4	2	(a)
Total score	19	20	27	17

Note:(a) We are unsure of the cost to develop the LGPRF into a format that could be incorporated into the rate cap formula.

Each approach has strengths and weaknesses. However, the data envelopment analysis approach best meets the criteria as it scores the highest (27). The data envelopment approach is accurate and applicable. This is because it can be used to generate an efficiency factor based on total factor productivity measures that are directly related to the sector.

The data envelopment approach is the most complex to explain and understand, and is the least cost effective. This approach also relies on judgements from the commission about the level of efficiency gains and the timeframe the gains are to be achieved over. It is not clear what information we would need to form those judgements. Although the local government performance reporting framework is objective, it is not a total factor productivity measure. It only measures unit costs on a per service basis, and further work would need to be undertaken to enable it to be used to estimate total factor productivity and overall efficiency. .

The strengths of the notional value approach are that it is simple and easy to understand and is cost effective. The strength of the proxy approach is that it is objective with minimal reliance on subjective judgements. The weakness of these approaches is that they are not based on input and output data related to the local government sector and therefore may not be as accurate or applicable.

Options for setting an efficiency factor

Our review of each approach against the criteria suggests that the data envelopment approach best meets the criteria. However the rate capping regime in Victoria is new and its effects on productivity change and technical efficiency are yet to be fully understood. This could initially increase the arbitrary nature of the values used for the expected efficiency gain and timeframe

over which it could reasonably be expected to be achieved. This leaves us with options to set the efficiency factor:

- Use the notional value and increase it by 0.05 per cent each year until it reaches 0.2 per cent. 0.2 per cent is at the top of the range of results generated by the three approaches. The advantage of this approach is it provides predictability to councils.
- Use the recommended proxy approach. Under this approach a new efficiency factor would be calculated each year based on ABS data. This is the approach used by IPART in NSW.
- Use a staged approach where we begin by using the notional value and then when the effects of rate capping are better understood use the data envelopment approach to estimate a long term efficiency factor that could be updated periodically (for example, every four years).

Indicative effect of an efficiency factor

We have modelled the estimated effects on total revenue of an efficiency factor increasing by 0.05 per cent per year from 2017–18 for the Victorian local government sector. Table 4.2 shows the effects over the period 2017–18 to 2020–21.

Table 4.2 Measuring the indicative effects of an efficiency factor for the Victorian local government sector

	2017–18	2018–19	2019–20	2020–21
Efficiency factor (%)	0.05	0.10	0.15	0.20
Total revenue $'000s (A)	9,587,871	9,847,266	10,013,843	10,269,882
Efficiency factor savings $000s (B)	2,472	5,046	7,906	11,028
Efficiency factor /total revenue (%) (B/Ax100)	0.026	0.051	0.079	0.11

Source: Victorian Council's 2017–18 budgets

The results show that even as the value of an efficiency factor increases, the effect on total revenue is still very small.

Other matters affecting efficiency

Our 2015 report on the local government rate capping and variation framework noted the diversity of circumstances across all 79 councils.[26]

A study by Drew, Kortt and Dollery (2015) on measuring efficiency in New South Wales councils, found that population levels had a positive effect on a council's technical efficiency. [27]This means the higher the population of a council, the greater the positive influence on efficiency.

Table 4.3 shows population at 2016, and historical and forecast population trends for each council group.

Table 4.3 Average population and population trends

Council Group	Average population 2016	Average growth rate 2011–16 (%)	Forecast average growth rate 2017–26 (%)
Interface	171,084	3.0	2.5
Large rural	29,361	0.6	1.1
Metropolitan	137,805	1.7	1.4
Regional centre	76,122	0.9	1.1
Small rural	9,386	-0.5	-0.2

Source: Victoria in Future 2016 (VIF2016) and ABS 2010 14, National Regional Profile. cat. no. 1379, ABS 2011 Census.

The small rural council group has the lowest average population and population fell by an average of 0.5 per cent per year over the period 2011 to 2016 and is forecast to fall by an average of 0.2 per cent per year from 2017 to 2026. All other groups have higher average and increasing populations. Further, Predictive Analytics Group's benchmarking results (see table 2.3) show that a relatively high percentage of small rural councils (37 per cent) are technically efficient relative to other small rural councils. This indicates that a number of small rural councils have adopted practices to overcome the disadvantage of low and declining populations to achieve full technical efficiency.

[26] Essential Services Commission 2015, *A Blueprint for Change, Local Government Rates Capping & Variation Framework Review — Draft Report Volume II*, July.

[27] Drew, Joseph, Michael Kortt, and Brian Dollery, 2015, "*What determines efficiency in local government? A DEA analysis of NSW local government." Economic Papers: A journal of applied economics and policy 34.4*.

Appendix A: Overview of the Victorian local government sector

There are currently 79 councils across the Victorian Local Government sector. Councils comprise elected representatives who serve to manage and make decisions on government services that are provided to local communities. In providing services to the community, councils are charged with the management of local infrastructure and enforcement of local laws. In Australia, statutory responsibility for local government falls under the jurisdiction of State and Territory Governments. The legal basis for councils in Victoria is found in the Local Government Act 1989. The Minister for Local Government (the minister) administers this Act and the various other Acts that define local government powers and responsibilities.

Differences between councils

Councils typically provide a range of services including activities related to planning, building, roads and parking, health services, community services, waste management, animal management, recreation and culture, local laws and emergency management.[28] The vast majority of these services are common to all Victorian councils. However, at the margins councils will provide different services, and to different standards. For example many councils provide a number of aquatic services (community swimming pools) to their community, but some do not.

The range of services and cost of providing them differ based on environmental, economic and demographic differences that local government areas are endowed with. Even where the services provided are the same, the cost of providing those services will again differ based on environmental, economic and demographic factor.

To assist in making comparisons, councils are typically grouped and categorised as either a metropolitan, interface, regional centre, large rural or small rural council.[29] The councils within these groups share increased commonality however the variation within the groups can still be large.

The groupings are primarily based on the geographic location of each municipality. Councils within Melbourne are in the metropolitan group whilst councils on the fringe of Melbourne are in the interface group. Regional centre councils are rural councils with significant rural cities. The remaining rural councils are grouped by population; large rural are councils with a population greater than 15 000 and small rural are councils with a population less than 15 000.

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[28] Department of Environment, Land, Water and Planning, What Councils Do, https://knowyourcouncil.vic.gov.au/guide-to-councils/what-councils-do

[29] These subgrouping of Victorian Local Governments is in line with the Victorian Local Government Comparator Groups.

Structural and demographic differences

Councils vary in population, from 3 069 (Queenscliffe) to 304 071 (Casey), and in the size of the area they service, from 8.6 square kilometres, (Queenscliffe) to 22 082.5 square kilometres (Mildura). However, the council groupings display relatively similar characteristics. For example, metropolitan councils are typically geographically small areas with large populations, a high amount of commercial activity and a small road network. Rural councils typically cover expansive geographic areas with small populations and large road networks.

Councils also vary at the rate at which their municipalities are experiencing change. Interface councils are currently undergoing rapid greenfield development which requires expanding infrastructure and services be provided to a fast growing, and often young, population. Many small rural councils on the other hand are experiencing a declining, aging population and are required to manage an older infrastructure network.

Tables A.1 and.A.2 summarise a number of key structural and demographic differences between council groups.

Table A.1 Structural difference by council groupings

Council grouping	Area (km^2)	Length of roads (km)	Number of bridges on local roads	Average number of businesses	Average number of households 2011
Small Rural	4 509	2 250	107	1 114	3 730
Large Rural	4 912	2 282	120	2 935	10 199
Regional Centre	3 938	1 919	89	5 748	31 092
Interface	820	1 364	59	10 933	46 661
Metropolitan	66	511	10	13 969	45 039

Source: VGC 2015–16 data, ABS 2010 14, National Regional Profile. cat. no. 1379, ABS 2011 Census.

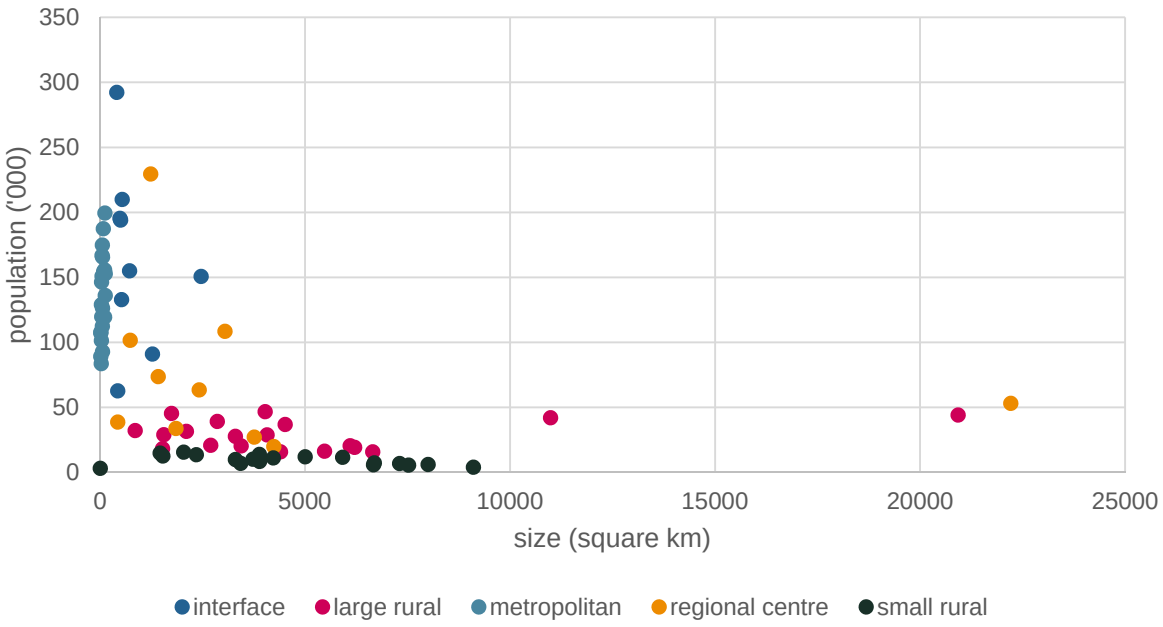
Table A.2 Demographic differences by council groupings

Council grouping	Average population size 2016	Population change 2015–2016 (%)	Percentage of population under 25	Percentage of population over 65	Average percentage of population born overseas 2011
Small Rural	9 386	-0.18	26	21	14
Large Rural	29 361	0.93	30	17	15
Regional Centre	76 122	1.02	33	15	16
Interface	171 084	3.37	35	10	30
Metropolitan	137 805	1.78	30	13	39

Source: ABS 2010 14, National Regional Profile. cat. no. 1379, ABS 2011 Census.

Figure A.1 compares council, size of area and population and indicates the grouping to which they belong. It is worth noting that the regional centre grouping is probably the least homogenous of the groupings, with a range of small and large councils.

Figure A.1 Council size and groupings



Local Government revenue

Councils have a number of internal and external revenue streams available to fund their responsibilities and obligations. These include government grants (both Federal and State), statutory fees and fines, user fees and contributions. However their primary own–source revenue stream is from general rates and municipal charges on properties within their local government area. These are capped under the Fair Go Rates system.

The proportion of each revenue stream varies between councils. Table A.3 summarises the ratio of each revenue source to total revenue by council grouping.

Table A.3 Composition of revenue by council grouping (2013–14 to 2015–16)

Council grouping	Rates and charges	Statutory fees and fines and user fees	Grants[a]	Contributions	Other income
Small rural	46.1	6.4	39.2	1.9	6.4
Large rural	50.5	10.5	28.7	5.7	4.7
Regional Centre	51.6	15.7	21.7	9.8	1.1
Interface	52.1	10.4	13.9	20.3	3.3
Metropolitan	60.3	16.5	11	5.5	6.8

[a] Indexation of Federal Financial Assistance Grants was frozen over this period.
Source: Council Annual Report 2013–14 to 2015–16

Metropolitan and interface councils source a high proportion of revenue from rates and charges whereas rural councils have a greater reliance on government grants. Rural councils also raise less revenue through user fees than metropolitan and interface councils. Developer contributions are greatest for the interface councils, and at 20.3 per cent is more than double the state average of 9.5 per cent. This is indicative of the development that is occurring in interface councils.

Local government expenditure

Councils typically categorise their expenditure into employee costs, materials and services, depreciation and amortisation, borrowings and a number of other minor expenses. Across almost all groupings employee costs are the largest category, accounting for 41.1 per cent of expenditure across the Victorian local government sector. The exception is the interface grouping, where 40.2 per cent of their expenditure is on materials and services. Table A.4 summarises expenditure by council grouping.

Table A.4 Composition of expenditure by council grouping (2013–14 to 2015–16)

Council grouping	Employee costs	Materials and services	Depreciation and amortisation	Borrowing costs	Other expenses
Small Rural	38.2	32.8	23.3	1.1	4.6
Large Rural	38.3	35.1	21.1	0.8	4.7
Regional Centre	40.6	31.1	17.7	1.1	9.5
Interface	38.3	40.2	15.9	1.2	4.4
Metropolitan	43.8	35.8	14.9	0.8	4.7

Source: Annual Report 2013–14 to 2015–16.

Rural councils' large share of depreciation and amortisations is largely due to their extensive road networks. This is not a cash expense but an estimation of the consumption of all non–current assets under council control. Almost all councils have low borrowings.

Appendix B: How the rate cap is set

Rate Cap

Each year since 2016–17, pursuant to section 185D (3)(a) of the *Local Government Act 1989* (the Act), the Minister for Local Government (the minister) has asked the commission for advice about the level of the average rate cap. The average rate cap (ARC) is used in the formula to calculate the maximum average rate paid by ratepayers.

We have advised the minister that the ARC should be calculated in accordance with the formula in box B.1.

Box B.1 Formula to calculate average rate cap

ARC = (0.6 x CPI) + (0.4 x WPI) — efficiency factor

The formula applies a 60 per cent weighting to the rate of increase in the CPI and a 40 per cent weighting to the WPI, less an efficiency factor. The allowance made for labour costs (WPI) in the rate cap formula serves only as a generalised acknowledgement that some costs, particularly direct and indirect labour costs, are inflexible in the short to medium term.

CPI and WPI figures should be based on December forecasts published by the Victorian Department of Treasury and Finance.

The efficiency factor was set at zero for the year 2016–17 and 0.05 per cent for the year 2017–18.

Furthermore, in both years we recommended that there should be a uniform rate cap for all councils and council groupings. If there were particular circumstances that suggested that the uniform rate cap should not apply to a particular council (for example, because of a unique pressure on costs or because the council was already highly productive) the commission's view was that this could be taken into account in any above–cap applications submitted by that council.

Minister's Cap

Table B.1 below shows a comparison between the rate cap advised by the commission and the cap enforced by the minister.

Table B.1 Comparison of commission's recommended cap with minister's cap

Year	commission's recommended average rate cap (%)	Average rate cap enforced by minister (%)
2016–17	2.80[a]	2.50
2017–18	2.15[b]	2.00

[a] WPI estimated to be 3.25 per cent. The efficiency factor was zero for this year. [b] WPI estimated to be 2.50 per cent. The recommendation also includes an efficiency factor of 0.05 per cent

For both years 2016–17 and 2017–18, the minister adopted an average rate cap that was consistent with forecast CPI. However for 2016–17 the CPI (and wages growth) was much lower than forecast, meaning that the cap actually enabled an increase in rates above both wages growth and the CPI.

Compliance with the Rate Cap

The rate cap is "the maximum annual rate of increase that councils can apply to their rate revenue based on the rate of increase in the consumer price index, wage price index and an efficiency factor".[30]

The cap applies to average rates per assessment. The commission monitors and publishes an annual rates report on councils' compliance with the average rate cap. To assess compliance with the applicable rate cap in 2016–17, the commission reviewed the estimation of the base average rate (BAR) and capped average rate (CAR) and verified that the CAR did not exceed the BAR by more than the applicable rate cap. Compliance is regarded if the BAR was formed in good faith and based on reasonable estimates. All 79 councils were found to be compliant in 2016–17.[31]

The base average rate in year t-1 is calculated according to the following formula in the legislation:

BAR = Rb/L where:

BAR is the base average rate

Rb is the total annualised revenue leviable from general rates, municipal charges and any other prescribed rates or charges on rateable properties within the council's municipal district as at 30 June in the base year

L is the number of rateable properties within the council's municipal district as at 30 June in the base year

The capped average rate in year t is calculated according to the following formula in the legislation:

CAR = Rc/L where

CAR is the capped average rate

Rc is the total annualised revenue leviable from general rates, municipal charges and any other prescribed rates or charges on rateable properties within the council's municipal district as at 1 July in the capped year

L is the number of rateable properties within the council's municipal district as at 1 July in the capped year

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30 Essential Services Commission 2015, *A Blueprint for Change, Local Government Rate Capping & Variation Framework Review — Final Report*, September, p. ix,

31 Essential Services Commission 2016, *How Councils Set Their Rates, Council Compliance with 2016–17 Rate Caps*, December, p. 2.

The term ‘average rates’ refers to the rates paid by the notional average ratepayer. The amount is calculated by dividing total revenue from general rates and municipal charges, by the total number of rateable properties in the municipality.

Appendix C: What does IPART do?

Since 1977, the Independent Pricing and Regulatory Tribunal (IPART) has set the maximum amount NSW councils can collect in general revenue through an annual 'rate peg'. Councils can request a variation to the peg from IPART.

Rate pegging limits the amount which councils can increase their general income. General income mainly comprises rates revenue, but also includes certain annual charges. It excludes stormwater and waste charges, and water and sewerage charges.[32] The rate peg is currently set by IPART under delegation from the minister for Local Government. Prior to 2011–12 the rate peg was set by the minister.

IPART has developed the Local Government Cost Index (LGCI) to measure changes in council costs. The LGCI is a measure of movements in the unit costs incurred by NSW councils for ordinary council activities funded from general rate revenue. The LGCI is designed to measure how much the price of a fixed 'basket' of inputs acquired by councils in a given period compares with the price of the same set of inputs in the base period.

The rate peg is calculated based on the change in the LGCI less the determined productivity factor (if material).

IPART Productivity Factor

In 2011–12 IPART introduced a productivity factor "to allow ratepayers to share in council productivity gains". The productivity factor is calculated using the ABS market sector[33] value added multifactor productivity (MFP) using a 15 year average. IPART notes that:

> *"In principle, an industry–specific productivity factor would be ideal. However, the ABS industry groupings do not adequately reflect the industries that we regulate using an index"*

IPART notes the reasons valued–added MFP is preferred over gross output are that it:

- avoids double counting intermediate inputs and outputs at the market sector level
- more accurately reflects actual productivity changes at the market sector level than the gross output measure of MFP
- is consistent with applying the wage price index (WPI) to the labour component of their cost indices.

However, it should be noted that IPART previously used the market–sector gross output measure of MFP until it was discontinued by the ABS in 2011.

A time frame of 15 years was selected to measures value–added MFP over. The reason behind a 15 year timeframe for measuring average productivity changes was that *"long–term (15–year) average smooths out short–term volatility in the index and therefore allow for a more consistent estimation of productivity over time."*

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[32] Many NSW Councils provide water and sewerage services, however Victorian councils do not.
[33] All 16 market sector industries collected by the ABS.

IPART elected to capture value–added MFP movements over a 15 year period using a geometric average. If the geometric average over a given period produces a negative value then IPART adjusts this to zero. The productivity factor was 0.001per cent for 2017–18. IPART decided that this was immaterial and set the factor to zero.

Table C.1 Indicators and productivity factors used by IPART

	2015–16	2016–17	2017–18
LGCI	2.47%	1.78%	1.47%
Productivity factor	0.04%	-0.05% (set to zero)	0.001% considered immaterial and set to zero
Rate Peg	2.4%	1.8%	1.5%

Appendix D: ABS sectors division classification

The following table details the industry divisions as defined by the ABS. The ABS also categorises the industries into market sector and non–market sector, and only provides estimates of productivity for market sector industries. The 16 market sector industries are those below, excluding divisions O, P and Q (Public Administration and Safety, Education and Training, and Healthcare and Social Assistance respectively).

Public Administration and Safety most closely aligns with the operations of local government, however, as estimates of productivity in this sector are not available, other options to indirectly estimate its productivity must be considered.

Table D.1 Industry divisions as defined by the ABS

	Division Title	Definition
A	Agriculture, Forestry and Fishing	Includes units mainly engaged in growing crops, raising animals, growing and harvesting timber, and harvesting fish and other animals from farms or their natural habitats. Included as production activities are horticulture, livestock production and aquaculture, forestry and logging, and fishing, hunting and trapping.
B	Mining	Includes units that mainly extract naturally occurring mineral solids, such as coal and ores; liquid minerals, such as crude petroleum; and gases, such as natural gas.
C	Manufacturing	Includes units mainly engaged in the physical or chemical transformation of materials, substances or components into new products (except agriculture and construction). The materials, substances or components transformed by units in this division are raw materials that are products of agriculture, forestry, fishing and mining, or products of other manufacturing units.
D	Electricity, Gas, Water and Waste Services	Comprises units engaged in the provision of electricity; gas through mains systems; water; drainage; and sewage services. This division also includes units mainly engaged in the collection, treatment and disposal of waste materials; remediation of contaminated materials (including land); and materials recovery activities. Electricity supply activities include the generation, transmission and distribution of electricity and the on–selling of electricity via power distribution systems operated by others.

Continued next page

Table D.1 (continued)

	Division Title	Definition
D	(continued)	Gas supply includes the distribution of gas, such as natural gas or liquefied petroleum gas, through mains systems. Water supply includes the storage, treatment and distribution of water; drainage services include the operation of drainage systems; and sewage services include the collection, treatment and disposal of waste through sewer systems and sewage treatment facilities.
E	Construction	Includes units mainly engaged in the construction of buildings and other structures, additions, alterations, reconstruction, installation, and maintenance and repairs of buildings and other structures Units engaged in demolition or wrecking of buildings and other structures, and clearing of building sites are included in Division E Construction. It also includes units engaged in blasting, test drilling, landfill, levelling, earthmoving, excavating, land drainage and other land preparation.
F	Wholesale Trade	Includes units mainly engaged in the purchase and onselling, the commission based buying, and the commission based selling of goods, without significant transformation, to businesses. Units are classified to the Wholesale Trade Division in the first instance if they buy goods and then onsell them (including on a commission basis) to businesses
G	Retail Trade	Includes units mainly engaged in the purchase and onselling, commission based buying, and commission based selling of goods, without significant transformation, to the general public
H	Accommodation and Food Services	Comprises of units providing short–term accommodation for visitors and/or meals, snacks, and beverages for consumption by customers both on and off–site. The division includes units providing accommodation, food/beverage, and hospitality services because one or more of these activities are undertaken by the same unit Excluded from this division are gambling institutions (casinos); amusement and recreation parks; long–term (residential) caravan parks; theatre restaurants; sporting clubs; and other recreation or entertainment facilities providing food, beverage, and accommodation services.

Continued next page

Table D.1 (continued)

	Division Title	Definition
I	Transport, Postal and Warehousing	Includes units mainly engaged in providing transportation of passengers and freight by road, rail, water or air. Other transportation activities such as postal services, pipeline transport and scenic and sightseeing transport are included in this division
J	Information Media and Telecommunications	Includes units mainly engaged in: • creating, enhancing and storing information products in media that allows for their dissemination; • transmitting information products using analogue and digital signals (via electronic, wireless, optical and other means); • providing transmission services and/or operating the infrastructure to enable the transmission and storage of information and information products. Information products are defined as those which are not necessarily tangible, and, unlike traditional goods, are not associated with a particular form.
K	Financial and Insurance Services	Includes units mainly engaged in financial transactions involving the creation, liquidation, or change in ownership of financial assets, and/or in facilitating financial transactions. The range of activities include: • raising funds by taking deposits and/or issuing securities and, in the process, incurring liabilities; • units investing their own funds in a range of financial assets; • pooling risk by underwriting insurance and annuities; • separately constituted funds engaged in the provision of retirement incomes; and • specialised services facilitating or supporting financial intermediation, insurance and employee benefit programs.
L	Rental, Hiring and Real Estate Services	Includes units mainly engaged in renting, hiring, or otherwise allowing the use of tangible or intangible assets (except copyrights), and units providing related services. The major portion of this division comprises units that rent, hire, or otherwise allow the use of their own assets by others. The assets may be tangible, as in the case of real estate and equipment, or intangible, as in the case with patents and trademarks.

Continued next page

Table D.1 (continued)

	Division Title	Definition
M	Professional, Scientific and Technical Services	Includes units mainly engaged in providing professional, scientific and technical services. Units engaged in providing these services apply common processes where labour inputs are integral to the production or service delivery. Units in this division specialise and sell their expertise. In most cases, equipment and materials are not major inputs
N	Administrative and Support Services	Includes units mainly engaged in performing routine support activities for the day–to–day operations of other businesses or organisations Administrative support services are mainly engaged in activities such as office administration; hiring and placing personnel for others; preparing documents; taking orders for clients by telephone; providing credit reporting or collecting services; arranging travel and travel tours. Support services are mainly engaged in activities such as building and other cleaning services; pest control services; gardening services; and packaging products for others
O	Public Administration and Safety	Includes units mainly engaged in Central, State or Local Government legislative, executive and judicial activities; in providing physical, social, economic and general public safety and security services; and in enforcing regulations
P	Education and Training	Includes units mainly engaged in the provision and support of education and training, except those engaged in the training of animals e.g. dog obedience training, horse training.
Q	Health Care and Social Assistance	Units mainly engaged in providing human health care and social assistance. Units engaged in providing these services apply common processes, where the labour inputs of practitioners with the requisite expertise and qualifications are integral to production or service delivery
R	Arts and Recreation Services	Includes units mainly engaged in the preservation and exhibition of objects and sites of historical, cultural or educational interest; the production of original artistic works and/or participation in live performances, events, or exhibits intended for public viewing; and the operation of facilities or the provision of services that enable patrons to participate in sporting or recreational activities, or to pursue amusement interests.

Continued next page

Table D.1 (continued)

	Division Title	Definition
S	Other Services	Includes a broad range of personal services; religious, civic, professional and other interest group services; selected repair and maintenance activities; and private households employing staff. Units in this division are mainly engaged in providing a range of personal care services, such as hair, beauty, diet and weight management services; providing death care services; promoting or administering religious events or activities; or promoting and defending the interests of their members

Appendix E: Council groupings

Metropolitan	Interface	Regional Centres	Large Rural	Small Rural
Banyule	Cardinia	Ballarat	Bass Coast	Alpine
Bayside	Casey	Greater Bendigo	Baw Baw	Ararat
Boroondara	Hume	Greater Geelong	Campaspe	Benalla
Brimbank	Melton	Greater Shepparton	Colac Otway	Buloke
Darebin	Mornington Peninsula	Horsham	Corangamite	Central Goldfields
Frankston	Nillumbik	Latrobe	East Gippsland	Gannawarra
Glen Eira	Whittlesea	Mildura	Glenelg	Hepburn
Greater Dandenong	Wyndham	Wangaratta	Golden Plains	Hindmarsh
Hobsons Bay	Yarra Ranges	Warrnambool	Macedon Ranges	Indigo
Kingston		Wodonga	Mitchell	Loddon
Knox			Moira	Mansfield
Manningham			Moorabool	Murrindindi
Maribyrnong			Mount Alexander	Northern Grampians
Maroondah			Moyne	Pyrenees
Melbourne			South Gippsland	Queenscliffe
Monash			Southern Grampians	Strathbogie
Moonee Valley			Surf Coast	Towong
Moreland			Swan Hill	West Wimmera
Port Phillip			Wellington	Yarriambiack
Stonnington				
Whitehorse				
Yarra				

Glossary

Insert term	Insert definition
Constant returns to scale (CRS)	The assumption that the relationship between inputs and outputs is constant. Namely, an increase in inputs results in commensurate and equal change in outputs.
Efficiency	Degree to which the observed use of resources to produce outputs of a given quality matches the optimal use of resources to produce outputs of a given quality.
Malmquist index	Allows for the quantification of change between economies. In this report, it is used to account for the change of efficiency indicators between two different years. The indictors are technical efficiency change and technological change.
Multiple group analysis	The construction of an individual production frontier for each council grouping, where councils are only compared to similar councils (from the same grouping) for the purpose of calculating a councils relative technical efficiency. Following this an average is taken for all 79 individual council technical efficiency scores to measure the average level of technical efficiency in Victoria Local Government Sector.
Production frontier	The line or curve plotting the minimum amount of an input (or combination of inputs) required to produce a given quantity of output (or combination of outputs).
Productivity	Measure of the output produced from the use of a given quantity of inputs. This may include all inputs and outputs (Total Factor Productivity) or a subset of inputs and outputs (Partial Productivity). Productivity varies as a result of differences in technological change and differences in technical efficiency.
Returns to scale	Relationship between outputs and inputs. Returns can be constant, increasing or decreasing depending on whether output increases in proportion to, more or less than inputs, respectively. In the case of multiple inputs and outputs, this refers to how outputs change when there is an equi–proportionate change in all inputs.
Single group analysis	The construction of a single production frontier, where a council is compared against all councils for the purpose of calculating a councils relative technical efficiency. Following this an average is taken for all the individual council technical efficiency's (calculated from the same frontier) to measure the average level of technical efficiency in Victoria Local Government Sector.
Technical efficiency	Conversion of inputs into outputs. Technical efficiency is determined by the difference between the observed ratio of combined quantities of an entity's output to input ratio achieved by best practice. It can be expressed as the potential to increase quantities of outputs from given quantities of inputs, or the potential to reduce quantities of inputs used in producing given quantities of outputs.

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Glossary (continued)

Insert term	Insert definition
Technological change	The expansion or contraction of efficiency due to technological changes (i.e. the adoption of new technologies resulting in the expansion or contraction of the production frontier). In essence, this variable indicates how innovative an entity has been with their technology.
Variable returns to scale (VRS)	The assumption that the relationship between inputs and outputs is an increasing or decreasing one.