Urban water sector: future cost and affordability analysis

The role of water reform in alleviating national household affordability issues

A confidential Final Report prepared for Infrastructure Australia

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<td>ARR</td>
<td>Annual Revenue Requirement</td>
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<td>CPI</td>
<td>Consumer Price Index</td>
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<td>IA</td>
<td>Infrastructure Australia</td>
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<td>NPR</td>
<td>National Performance Report</td>
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<td>RAB</td>
<td>Regulatory Asset Base</td>
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<td>WACC</td>
<td>Weighted Average Cost of Capital</td>
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Executive summary

Background

Infrastructure Australia (IA) engaged Aither to analyse the impact of future costs on water and wastewater bills in Australia’s metropolitan urban water sector. The results of this analysis are presented in this report and contextualise the potential benefits of implementing a suite of urban water reform recommendations outlined in IA’s report titled Urban Water Reform: A reform pathway for Australia’s urban water sector. Specifically, this report

• describes future urban water cost drivers
• estimates future revenue requirements to cover possible future costs, and
• models the impact of future costs on water and sewerage bills under various possible future expenditure increases and an efficiency gain assumption.

Cost drivers in Australia’s urban water sector

Both the National Water Commission (2011a) and WSAA (2010) have identified future costs as a key challenge for the urban water sector in Australia. In the future, a range of factors will affect future costs for urban water and sewerage services. Key drivers range from exogenous factors such as climate change and variability to sector-specific factors such as a desire for continued improvement in levels of service and ageing assets.

Improvements in technology, such as the use of remote telemetry and drones to monitor asset condition and water use efficiency have the potential to reduce costs. However, the simple fact remains that major cost drivers such as ageing assets and greenfield and infill development to cater for population growth will necessitate significant investment in infrastructure augmentation, renewals and asset maintenance. The cost of urban water and wastewater system augmentation will be more expensive than in the past as the most cost effective sites for bulk water and wastewater infrastructure have already been developed. Continued improvements in regulations and standards (e.g. for disposal of treated wastewater or public health outcomes) will contribute to rising costs.

While the customer base will continue to expand as new dwellings are constructed and the population grows (thus increasing the revenue base), this is not expected to match the required rate of expenditure required to maintain service standards.

Methodology and approach

The analysis was informed by Aither’s ‘building blocks’ water price model for the Australian metropolitan water sector. The building blocks approach, which is applied almost universally across Australia’s metropolitan water sector, calculates the revenue that should be recovered from customers through water and wastewater charges. The building blocks which make up the Annual Revenue Requirement (ARR) comprise:

• A return on capital (Weighted Average Cost of Capital (WACC) x Regulatory Asset Base (RAB)) +
• A return of capital (regulatory depreciation) +
• Operating expenditure (including administration and maintenance costs)\(^1\)

In summary, Aither’s building blocks water price model for the Australian metropolitan water sector was developed by:

• Establishing RAB values for each water utility that services metropolitan areas from price determinations and other data sources (refer Attachment B)\(^2\)\(^3\)

• Indexing RAB values to 2016 dollars for the small number of RAB values where 2016 estimates were not available and accounting for capital expenditure and depreciation in the intervening years

• Calculating an amalgamated metropolitan water revenue requirement

• Applying a long-term estimate of Weighted Average Cost of Capital to calculate return on capital

• Calibrating the model to ensure it reflects a current representative water and sewerage bill\(^4\)

• Calculating indicative representative bills under possible future expenditure increases (described below) over a fifty year, forward-looking period using ARR estimates and residential connection data from the National Performance Report (NPR) which has been forecast forward based on analysis from the National Housing Supply Council.

### Possible future expenditure increases

Data on future capital and operating expenditure requirements in the metropolitan water sector is limited to information in price determinations which generally covers a four or five year forward period. Given that each jurisdiction is at different stages within the price period cycle, there is no long-term, industry accepted estimate of forward capital and operating expenditure requirements. Global Water Intelligence has forecast compound annual expenditure across the water and wastewater sector between 2016 and 2020 to grow as follows:

- **Total expenditure** – 4.9 per cent
- **CAPEX** – 6.3 per cent
- **OPEX** – 4.4 per cent.

In the absence of an alternative estimate and given that the range of cost drivers impacting the sector, the base case assumes a 4.5 per annum increase in capital and operating expenditure relative to average capital and operating expenditure over the past five years. Using average expenditure from the last five years is a conservative assumption as this period excludes the large uptick in expenditure to augment bulk water infrastructure during the millennium drought. The base case and all possible future expenditure increases also assume a uniform increase in WACC rising from 4 per cent in 2017 to 6.4% in 2022 in line with a long-term WACC forecast provided by the Independent Pricing and Regulatory Tribunal (2016). After the initial 5 year period of WACC increases, the long-term forecast is held constant, resulting in variation in return on capital in the first five years.

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\(^1\) A short description of the building blocks methodology including the cost elements that make up the building blocks is contained in Attachment A.

\(^2\) Data on the RAB for Power and Water Corporation which services the Northern Territory was not available. The Northern Territory has therefore been excluded from the analysis.

\(^3\) In South Australia, Western Australia and Tasmania, a vertically integrated water utility services the entire state. RAB values and capital and operating expenditure data are not available for the metropolitan area for each of these utilities. Therefore, the data underpinning the model in these states applies to the whole state in these cases.

\(^4\) Before possible future expenditure increases can be tested, the base model needs to reflect representative bills.
Efficiency gain assumption

A literature review has been undertaken to inform an estimate of the efficiency gains that could be realised by implementing the policy, institutional and regulatory reforms outlined in IA’s Report titled *Urban Water Reform: A reform pathway for Australia’s urban water sector*. A review by Cave (2009) estimated an efficiency saving of 10 per cent per annum as a result of reforms in the United Kingdom. A 2011 investigation by the National Water Commission used the results of Cave’s study to estimate the impacts of competition reforms on average residential bills in Australia. To model potential impacts of an efficiency gain, the model assumes a 10 per cent decrease on future capital and operating expenditure relative to the base case which has been applied from 2020 onwards to allow time for reforms to be implemented.

Model limitations

The analysis is based on an amalgamation of urban water sector data across Australia. As a result there are a number of assumptions that underpin the model, and limitations to the outputs generated. These are discussed in the methodology section, however it should be noted in the first instance that results are not intended to provide definitive and precise future forecasts. Rather, the model has been designed to indicate the likely (and relative) trajectory of future bill impacts under possible future expenditure outcomes.

While further analysis would be required to map the likely profile of capital and operating expenditure over time to improve confidence in the model results, if future capital and operating expenditure does increase in real terms, there is a strong case for governments to at least consider how urban water reform could reduce the impact of future bill increases.

Results

Under the base case, which assumes a 4.5 per cent increase in capital and operating costs per annum, a typical residential water and sewerage bill is estimated to increase from $1,226 in 2017 to $1,827 in 2027 in real terms (i.e. excluding the impact of inflation). By 2040, a typical residential water and sewerage bill is estimated to rise to $2,553 in real terms. Figure 1 shows the estimated trajectory of bills under the base case.
Figure 1  Future water and sewerage bills under the base case

A 10 per cent per annum saving on future capital and operating expenditure due to an efficiency gain from 2020 onwards under the base case results in a $146 saving per household in 2020. Under the efficiency assumption, bills increase to $1,646 in 2027. This equates to an annual saving of $181 per household in 2027. The impact of the efficiency gain is shown in Figure 2.

Note:  Bills are presented in $2015/16 constant dollars and exclude inflation. The trajectory is not smooth in the first five years due to variation in return on capital estimates as the WACC transitions up to the long-term average.
Figure 2  Future water and sewerage bills under an efficiency assumption relative to the base case

The potential benefits of reform are most evident when assessed in terms of the cumulative per household savings and total savings. Figure 3 shows the cumulative household water and sewerage bill saving under an efficiency assumption relative to the base case. By 2027, each household is forecast to save $1,332 in real terms. By 2040, the cumulative household saving reaches approximately $4,135 in real terms and rises to over $14,853 by 2067.

Across all households, the total bill saving in 2020 (the first year after reforms are assumed to be operational) equates to just over $1 billion and rises to $1.52 billion by 2027. By 2040, the aggregate bill saving is just under $2.6 billion and reaches $8.46 billion by 2067 (Figure 4).
Figure 3  Cumulative household water and sewerage bill saving under an efficiency assumption relative to the base case

Figure 4  Aggregate (across all households) water and sewerage bill saving under an efficiency assumption relative to the base case
Implications for the Australian urban water sector

The results of this analysis suggest that:

- A range of cost drivers including ageing assets, population growth, climate variability and change and higher costs to service greenfield development will continue to see household water and sewerage bills increase in real terms.

- The magnitude of future household bill increases is directly influenced by the extent to which capital and operating costs increase.

- While the estimates of future capital and operating expenditure applied in this analysis are based on broad assumptions, the results show that water and sewerage bills are expected to rise such that the cumulative effect on households is likely to be material.

- A report by the Australian Council of Social Services (2014) found that the number of Australian residents living in poverty is growing and now exceeds 2.5 million people or approximately 14 per cent of the population in 2014.

- The combination of rising water and sewerage prices, rising energy costs and below average increases in real wage growth underscores the importance of reform in the water sector to play a role in addressing national household affordability issues.

- Without reform, rising costs of water and sewerage provision and associated bill increases could result in deleterious responses from policy-makers and water service providers. Addressing systemic affordability issues should not be addressed through short-term approaches such as running down assets, avoiding maintenance or delaying new investment decisions to the point that critical supply triggers are reached or service standards decline.

- Rather, sound institutional, policy, governance and regulatory reform are required to better position the industry for the future. Governance and institutional reform to establish clear roles and responsibility as well as improved supply planning are critical to improving efficiency within the sector.

- As WSAA (2015) note “sustaining urban water infrastructure investment, while containing consumer prices, will require new levels of productivity, innovation and efficiency—in turn, requiring evolved regulation and governance”.

- The reform pathway outlined in IA’s report titled Urban Water Reform: A reform pathway for Australia’s urban water sector should be considered further by governments, refined as necessary, and implemented without delay in order to reduce the impact on households of rising water and sewerage bills.

Areas for further analysis

The model assumes an annual increase in capital and operating expenditure of 4.5 per cent per annum over the life of the analysis. In practice, capital expenditure will track upwards at a slower rate with large upticks where major supply capacity upgrades are undertaken. Further analysis to map the likely profile of capital expenditure over the medium term would improve confidence in the model results.
1. Introduction

1.1. Project background and scope

In 2016, Infrastructure Australia (IA) engaged Aither to develop a reform pathway for Australia’s urban water sector. The report, titled: Urban Water Reform: A reform pathway for Australia’s urban water sector outlined a range of policy, institutional and regulatory reforms designed to position the sector to deal with future challenges.

In 2017, IA engaged Aither to analyse the impact of future costs on water and wastewater bills in Australia’s metropolitan urban water sector. The results of this analysis are presented in this report and contextualise the potential benefits of implementing the reform recommendations outlined in the reform pathway report. Specifically, this report:

- describes future urban water cost drivers,
- estimates future revenue requirements to cover possible future costs, and
- models the impact of future costs on water and sewerage bills under various possible future expenditure increases and an efficiency gain assumption.

The report provides a high-level indication of the potential bill outcomes under possible future cost outcomes and is intended to help demonstrate the underlying need and potential benefits of reform.

1.2. Definition of the urban water sector

The analysis uses data for each water service provider that services metropolitan areas, excluding Power and Water Corporation, which services Darwin. In Western Australia, South Australia and Tasmania, where a state-wide water service provider operates, it was not possible to split RAB values and capital and operating expenditure data to capture the metropolitan area only. The analysis therefore includes each of these jurisdictions as a whole. Water service providers in scope are outlined in Appendix B. For the purposes of this report, the urban water sector includes water and wastewater. The analysis excludes stormwater and drainage services.

1.3. Report structure

Reflecting the project scope, this report is structured as follows:

- Section two describes future cost drivers in the urban water sector
- Section three presents the results of the analysis
- Section four outlines conclusions for the Australian urban water sector.
- Appendix A describes the project methodology.

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5 Data on the RAB for Power and Water Corporation which services the Northern Territory was not available. The Northern Territory has therefore been excluded from the analysis.

6 Although a small percentage of expenditure for some water service providers will relate to stormwater and drainage services.
1.4. Limitations

As noted above, the analysis undertaken for this project is based on an amalgamation of urban water sector data across Australia. As a result there are a number of assumptions that underpin the model, and limitations to the outputs generated. These are discussed in the methodology section, however it should be noted in the first instance that results are not intended to provide definitive and precise future forecasts. Rather, the model has been designed to indicate the likely (and relative) trajectory of future bill impacts under possible future cost outcomes.
2. Cost drivers in Australia’s urban water sector

2.1. Overview

A range of factors will affect future costs for urban water and sewerage services. Key drivers range from exogenous factors such as climate change and variability to sector-specific factors such as ageing assets and a desire for continued improvement in levels of service.

Figure 5 shows some of the key future drivers of cost increases and decreases in Australian’s urban water sector. Improvements in technology, such as the use of remote telemetry and drones to monitor asset condition and water use efficiency have the potential to reduce costs. However, the simple fact remains that major cost drivers such as ageing assets and greenfield and infill development to cater for population growth will necessitate significant investment in infrastructure augmentation, renewals and asset maintenance. Servicing greenfield lots will impact overall costs at a higher rate than greenfield lots. For example, in 2015, Sydney Water estimated that the cost of servicing greenfield lots is on average, 5–6 times higher than costs to service infill lots (Sydney Water, 2015). Industry data suggests that approximately 35 per cent of forecast expenditure over the next five years will be to service growth.

The cost of urban water and wastewater system augmentation will be more expensive than in the past as the most cost effective sites for bulk water and wastewater infrastructure have already been developed. Continued improvements in regulations and standards (e.g. for disposal of treated wastewater or public health outcomes) will contribute to rising costs. Both the National Water Commission (2011a) and WSAA (2010) have identified future costs as a key challenge for the urban water sector in Australia.

While the customer base will continue to expand as new dwellings are constructed and the population grows (thus increasing the revenue base), this is not expected to match the required rate of expenditure required to maintain service standards. Furthermore, new lots are more water efficient relative to existing lots due to more water efficient appliances. New units use less water as there is less outdoor water use to water lawns and gardens. This means that while the customer base increases as new lots are developed, these lots do not recover sufficient revenue to pay for themselves under tariffs which include a mix of fixed and variable charges. This revenue needs to be recovered across the entire customer base, pushing up bills.
Figure 5 presents cost drivers only. Other factors including waste to energy projects and developer contributions will affect revenue and the ARR.

**Figure 5  Key cost drivers in Australia’s urban water sector**

It is clear from Figure 5 that the majority of drivers for future costs will place upward pressure on costs which will increase the Annual Revenue Requirement (ARR). As a result it is expected that customer water and sewerage bills will increase above current rates of inflation. Positioning the urban water sector to best manage future costs will be critical to reducing the impact of rising bills on households.

### 2.2. The impact of higher costs on water and sewerage bills

The urban water sector in Australia predominantly relies on customers to recover the costs of service provision through water and sewerage charges. As capital and operating costs increase, water and sewerage bills increase to recover the revenue required by service providers to fund expenditure.

In most jurisdictions, RAB values that are used to formulate water and sewerage charges were initially valued using expected revenues from prices that prevailed at the time when the opening RAB values were set. In practice, this means that RAB values (and prices that are derived from the values) in some jurisdictions were, and continue to remain, lower than the depreciated replacement cost of assets. As new assets replace old assets, the RAB value increases which translates into higher customer bills (refer to Appendix A for a brief description of the approach to setting water and sewerage charges). In practice, this means that annual capital expenditure is higher than depreciation costs.
3. Results

3.1. Future water and sewerage bills

3.1.1. Base case

Under the base case, which assumes a 4.5 per cent increase in capital and operating costs per annum, a typical residential water and sewerage bill is estimated to increase from $1,226 in 2017 to $1,827 in 2027 in real terms (i.e. excluding the impact of inflation). By 2040, a typical residential water and sewerage bill is estimated to rise to $2,553 in real terms. Figure 6 shows the estimated trajectory of bills under the base case.

![Future water and sewerage bills under the base case](source: Aither, 2017)

Note: Bills are presented in $2015/16 constant dollars and exclude inflation. The trajectory is not smooth in the first five years due to variation in return on capital estimates as the WACC transitions up to the long-term average.

3.1.2. Sector reform efficiency assumption

A 10 per cent per annum saving on future capital and operating expenditure from 2020 onwards under the base case results in a $146 saving per household in 2020. Under the efficiency assumption, bills increase to $1,646 in 2027. This equates to an annual saving of $181 per household in 2027. The impact of the efficiency gain is shown in Figure 7.

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7 Although the methodology differs, a report by the National Water Commission (2011) also estimated an annual household saving of $60 attributable to a range of urban water reforms.
The trajectory is not smooth in the first five years due to variation in return on capital estimates as the WACC transitions up to the long-term average.

**Figure 7  Future water and sewerage bills under an efficiency assumption relative to the base case**

The potential benefits of reform are most evident when assessed in terms of the cumulative household saving and total saving. Figure 8 shows the cumulative household water and sewerage bill saving under an efficiency assumption relative to the base case. By 2027, each household is forecast to save $1,332 in real terms. By 2040, the cumulative household saving reaches approximately $4,135 in real terms and rises to over $14,853 by 2067.

Across all households, the total bill saving in 2020 (the first year after reforms are assumed to be operational) equates to just over $1 billion and rises to $1.52 billion by 2027. By 2040, the aggregate bill saving is just under $2.6 billion and reaches $8.46 billion by 2067 (Figure 9).
Figure 8  Cumulative household water and sewerage bill saving under an efficiency assumption relative to the base case

Figure 9  Aggregate (across all households) water and sewerage bill saving under an efficiency assumption relative to the base case
3.2. Future revenue requirements

Water and sewerage bills are a function of the revenue required to be collected from water service providers to fund capital and operating expenditure and a return of (depreciation) and on capital. As costs increase, so too do revenue requirements.

3.2.1. Base case

Under the base case, which assumes a 4.5 cent increase in capital and operating costs per annum, the aggregate annual revenue requirement across all service providers that service metropolitan areas is forecast to increase from just under $9.9 billion in 2017 to approximately $17.2 billion in 2027. By 2040, the aggregate annual revenue requirement is forecast to reach approximately $28.8 billion and rises to over $90 billion in 2067 (Figure 10).

![Graph showing annual revenue requirement under the base case](image-url)

Source: Aither, 2017
Note: ARR’s are presented in $2015/16 constant dollars and exclude inflation

Figure 10  Annual revenue requirement under the base case
3.3. Alternative possible future expenditure increases

Given the possibility that costs could increase above those assumed in the base case, analysis has been undertaken on the impact on water and sewerage bills of an annual increase in capital and operating expenditure of 5 and 5.5 per cent per annum. The results are presented in Figure 11.

Source: Aither, 2017

Note: Bills are presented in $2015/16 constant dollars and exclude inflation

**Figure 11** Future water and sewerage bills under a 4.5, 5 and 5.5 per cent per annum increase in capital and operating expenditure

Under a 5 per cent per annum capital and operating expenditure increase, a typical water and sewerage bill is forecast to rise in real terms from $1,229 in 2017 to $1,880 in 2027 and $2,762 in 2040. Under this possible future expenditure increase, the cumulative impact on household bill savings as a result of reform implementation, which is shown in Figure 12, is material. By 2027, a typical household is forecast to have saved $1,367 in real terms. By 2040, this figure rises to $4,371 and just under $17,100 per household by 2067.
In aggregate, across all households, the annual saving on water and sewerage bills of reform implementation under a 5 per cent per annum increase in capital and operating expenditure rises from just under $1.1 billion in 2020 to $2.9 billion in 2040 and $10.6 billion by 2067 (Figure 13).
Figure 13  Aggregate (across all households) water and sewerage bill cost under a 5 per cent per annum increase in capital and operating expenditure

A 10 per cent per annum saving on future capital and operating expenditure from 2020 onwards under a 5 per cent annual expenditure increase results in a $148 saving per household in 2020⁸, with bills increasing to $1,692 in 2027. This equates to an annual saving of $188 per household in 2027. The impact of the efficiency gain is shown in Figure 14.

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⁸ Although the methodology differs, a report by the National Water Commission (2011) also estimated an annual household saving of $60 attributable to a range of urban water reforms
Figure 14  Water and sewerage bill saving under an efficiency assumption and 5 per cent per annum increase in capital and operating expenditure

Under a 5.5 per cent per annum capital and operating expenditure increase, a typical water and sewerage bill is forecast to rise substantially in real terms from $1,241 in 2017 to $2,008 in 2027 and $3,193 in 2040 and up to $9,981 by 2067.

Under this possible future expenditure increase, the cumulative impact on household bill savings as a result of reform implementation, which is shown in Figure 15, is significant. By 2027, a typical household is forecast to have saved $1,432 in real terms. By 2040, this figure rises to $4,789 and $21,018 by 2067.
In aggregate, across all households, the annual saving on water and sewerage bills of reform implementation under a 5.5 per cent per annum increase in capital and operating expenditure rises from approximately $1.2 billion in 2020 to just over $3.3 billion in 2040 up to $14.4 billion in 2067 (Figure 16).
Figure 16  Aggregate (across all households) water and sewerage bill saving an efficiency assumption and 5.5 per cent per annum increase in capital and operating expenditure

A 10 per cent per annum saving on future capital and operating expenditure from 2020 onwards under the 5.5 per cent expenditure and efficiency gain assumption results in a $152 saving per household in 2020\(^9\), with bills increasing to $1,807 in 2027. This equates to an annual saving of $201 per household in 2027. The impact of the efficiency gain is shown in Figure 17.

\[\text{Cumulative bill saving per household} \]

\[\begin{align*}
\text{2017} & : \text{~} \\
\text{2020} & : \text{~} \\
\text{2023} & : \text{~} \\
\text{2026} & : \text{~} \\
\text{2029} & : \text{~} \\
\text{2032} & : \text{~} \\
\text{2035} & : \text{~} \\
\text{2038} & : \text{~} \\
\text{2041} & : \text{~} \\
\text{2044} & : \text{~} \\
\text{2047} & : \text{~} \\
\text{2050} & : \text{~} \\
\text{2053} & : \text{~} \\
\text{2056} & : \text{~} \\
\text{2059} & : \text{~} \\
\text{2062} & : \text{~} \\
\text{2065} & : \text{~}
\end{align*}\]

Source: Aither, 2017

Note: Bill savings are presented in 2015/16 constant dollars and exclude inflation

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\(^9\) Although the methodology differs, a report by the National Water Commission (2011) also estimated an annual household saving of $60 attributable to a range of urban water reforms.
3.4. Impact of bill increases

The results show that water and sewerage bills will rise such that the impact on households is likely to be material under all possible future capital and operating expenditure increases. A report by the Australian Council of Social Services (2014) found that the number of Australian residents living in poverty is growing and now exceeds 2.5 million people or approximately 14 per cent of the population in 2014. The combination of rising water and sewerage prices, rising energy costs and below average increases in real wage growth underscores the importance of reform in the water sector to play a role in addressing national household affordability issues.

3.5. Economy-wide benefits of urban water reform

The estimated water and sewerage bill savings resulting from urban water reform described above will contribute to easing financial pressures on households which frees up more of the household budget to be spent on other goods and services in other sectors in the economy.
4. Conclusions

The results of this analysis suggest that:

- A range of cost drivers including ageing assets, population growth, climate variability and change and higher costs to service greenfield development will continue to see household water and sewerage bills increase in real terms.

- The magnitude of future household bill increases is directly influenced by the extent to which capital and operating costs increase.

- While the estimates of future capital and operating expenditure applied in this analysis are based on broad assumptions, the results show that water and sewerage bills could rise such that the cumulative effect on households is likely to be material.

- A report by the Australian Council of Social Services (2014) found that the number of Australian residents living in poverty is growing and now exceeds 2.5 million people or approximately 14 per cent of the population in 2014.

- The combination of rising water and sewerage prices, rising energy costs and below average increases in real wage growth underscores the importance of reform in the water sector to play a role in addressing national household affordability issues.

- Without reform, rising costs of water and sewerage provision and associated bill increases could result in deleterious responses from policy-makers and water service providers. Addressing systemic affordability issues should not be addressed through short-term approaches such as running down assets, avoiding maintenance or delaying new investment decisions to the point that critical supply triggers are reached or service standards decline.

- Rather, sound institutional, policy, governance and regulatory reform are required to better position the industry for the future. Governance and institutional reform to establish clear roles and responsibility as well as improved supply planning are critical to improving efficiency within the sector.

- As WSAA (2015) note “sustaining urban water infrastructure investment, while containing consumer prices, will require new levels of productivity, innovation and efficiency—in turn, requiring evolved regulation and governance”.

- The reform pathway outlined in IA’s report titled Urban Water Reform: A reform pathway for Australia’s urban water sector should be considered further by governments, refined as necessary, and implemented without delay in order to reduce the impact on households of rising water and sewerage bills.

4.1. Areas for further analysis

The model assumes an annual increase in capital and operating expenditure of 4.5 per cent per annum over the life of the analysis. In practice, capital expenditure will track up at a slower rate with large upticks where major supply capacity upgrades are undertaken. Further analysis to map the likely profile of capital expenditure over the medium term would improve confidence in the model results.
5. References


Infrastructure Australia, 2016, Australian Infrastructure Plan: Priorities and Reforms for our Nation’s Future.


Water Services Association of Australia, 2015, Doing the important, as well as the urgent: Reforming the Urban Water Sector.
Appendix A - Methodology

Model description

The analysis was informed by Aither’s building blocks water price model for the Australian metropolitan water sector. The building blocks approach, which is applied almost universally across Australia’s metropolitan water sector, calculates the revenue that should be recovered from customers through water and wastewater charges. In summary, the building blocks which make up the ARR comprise:

- A return on capital (Weighted Average Cost of Capital (WACC) x RAB) +
- A return of capital (regulatory depreciation) +
- Operating expenditure (including administration and maintenance costs)\(^\text{10}\)

In summary, Aither’s building blocks water price model for the Australian metropolitan water sector was developed by:

- Establishing RAB values for each water utility that services metropolitan areas from price determinations and other data sources (refer Attachment B)\(^\text{11,12}\)
- Indexing RAB values to 2016 dollars for the small number of RAB values where 2016 estimates were not available and accounting for capital expenditure and depreciation in the intervening years
- Calculating an amalgamated metropolitan water revenue requirement
- Applying a long-term estimate of Weighted Average Cost of Capital to calculate return on capital
- Calibrating the model to ensure it reflects a current representative water and sewerage bill\(^\text{13}\)
- Calculating indicative representative bills under various possible future expenditure increases (described below) over a fifty year, forward-looking period using ARR estimates and residential connection data from the National Performance Report (NPR) which has been forecast forward based on analysis from the National Housing Supply Council.

Expenditure increase descriptions

Base case description

Data on future capital and operating expenditure requirements in the metropolitan water sector is limited to information in price determinations which generally covers a four or five year forward period.

\(^\text{10}\) A short description of the building blocks methodology including the cost elements that make up the building blocks is contained in Attachment A.

\(^\text{11}\) Data on the RAB for Power and Water Corporation which services the Northern Territory was not available. The Northern Territory has therefore been excluded from the analysis.

\(^\text{12}\) In South Australia, Western Australia and Tasmania, a vertically integrated water utility services the entire state. RAB values and capital and operating expenditure data is not available for the metropolitan area for each of these utilities. Therefore, the data underpinning the model in these states applies to the whole state in these cases.

\(^\text{13}\) Before possible future expenditure increases can be tested, the base model needs to reflect representative bills.
Given that each jurisdiction is at different stages within the price period cycle, there is no long-term, industry accepted estimate of forward capital and operating expenditure requirements. Global Water Intelligence has forecast compound annual expenditure across the water and wastewater sector between 2016 and 2020 to grow as follows:

- Total expenditure – 4.9 per cent
- CAPEX – 6.3 per cent
- OPEX – 4.4 per cent.

In the absence of an alternative estimate and given that the range of cost drivers impacting the sector, the base case assumes a 4.5 per cent per annum increase in capital and operating expenditure relative to average capital and operating expenditure over the past five years. Using average expenditure over the past five years is a conservative assumption as it excludes the large uptick in expenditure to augment bulk water infrastructure during the millennium drought.

The profile of capital expenditure in the water sector is lumpy, evidenced by the large uptick in expenditure to augment bulk water infrastructure during the millennium drought. In the base case, the profile of capital expenditure has not been mapped as there is insufficient data to do so. For example, the next major round of infrastructure augmentation for bulk water and wastewater assets has not been accounted for. Rather, the base case assumes a 4.5 per cent smoothed increase in capital and operating expenditure which, given a projected increase in dwellings of just under 2 per cent per annum and the cost drivers outlined in section 2, is considered to be a reasonable, long-term estimate for the purposes of this analysis.

Sector reform efficiency assumption

A literature review has been undertaken to inform an estimate of the efficiency gains that could be realised by implementing the policy, institutional and regulatory reforms outlined in IA’s Report titled Urban Water Reform: A reform pathway for Australia’s urban water sector.

A review by Cave (2009) estimated an efficiency saving of 10 per cent per annum as a result of reforms in the United Kingdom.14 A 2011 investigation by the National Water Commission used the results of Cave’s study to estimate the impacts of competition reforms on average residential bills in Australia.15 To model potential impacts of an efficiency gain, the model assumes a 10 per cent decrease on future capital and operating expenditure relative to the base case which has been applied from 2020 onwards to allow time for reforms to be implemented.

Model inputs and parameters

Overview

The key inputs and parameters for Aither’s building blocks water price model for the Australian metropolitan water sector are summarised in the table below. The primary inputs relate to the forecast capital and operating costs for the infrastructure, along with increases in the customer base (dwelling numbers) into the future.

---

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Description</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening RAB value</td>
<td>$90.2 billion ($2015/16)</td>
<td>Amalgamated RAB values described in Attachment B.</td>
<td>Various (see Appendix B)</td>
</tr>
<tr>
<td>Future capital and operating expenditure</td>
<td>4.5 per cent per annum under base case</td>
<td>4.5 per cent increase per annum on average expenditure over the last five years</td>
<td>Based on Global Water Intelligence estimate</td>
</tr>
<tr>
<td>Residential connection data (existing)</td>
<td>Approximately 6.6 million in 2015/16</td>
<td>Residential connections used as the customer base (or denominator) over which the revenue requirement is recovered</td>
<td>National Performance Report</td>
</tr>
<tr>
<td>Residential connection data (future)</td>
<td>Approximately 150,000 per annum</td>
<td>Residential connections used as the customer base (or denominator) over which the revenue requirement is recovered</td>
<td>McDonald, P. and Temple, J. (2013). Report Commissioned by the National Housing Supply Council (forecasts out to 2046)</td>
</tr>
<tr>
<td>New dwelling adjustment</td>
<td>80 per cent</td>
<td>New suburbs (and increasingly dense infill areas) are likely to be more water efficient, resulting in lower revenue generation.</td>
<td>Aither based on unpublished industry estimate</td>
</tr>
<tr>
<td>Weighted Average Cost of Capital (WACC)</td>
<td>4 per cent trending up to a long-term average of 6.4 per cent (IPART, 2016).</td>
<td>The pre-tax real rate of return applied to the RAB</td>
<td>Aither</td>
</tr>
<tr>
<td>Consumer Price Index (CPI)</td>
<td>2.5 per cent</td>
<td>Used to index RAB values and capital and operating expenditure to $2016</td>
<td>Middle of the RBA’s target range</td>
</tr>
<tr>
<td>Proportion of ARR recovered from non-residential customers</td>
<td>85 per cent</td>
<td>Revenue recovered from non-residential customers is excluded from the bill analysis</td>
<td>Approximation (by Aither)</td>
</tr>
<tr>
<td>Efficiency gain</td>
<td>10 per cent per annum</td>
<td>10 per cent per annum saving applied to capital and operating expenditure from 2020 onwards</td>
<td>Based on findings by Cave, 2009.</td>
</tr>
</tbody>
</table>
Treatment of bulk water charges

In Sydney, Melbourne and Brisbane, there is vertical separation between bulk and retail water service providers. Bulk water charges are treated as an operating cost pass through for the retail entities. The ARR for bulk water assets is calculated off the RAB values and operating costs for the bulk water providers. To avoid double counting, bulk water costs incurred by the retail entities and passed on to customers have been excluded.

Model outputs

Estimates of future bills and revenue requirements are presented in real, $2016 dollars. The impact of inflation would be additional to the outputs reported here.

Model limitations

The analysis undertaken for this project is based on an amalgamation of the urban water sector across Australia. In practice, the future trajectory of costs, prices and bills will vary across metropolitan areas due to a range of factors, including, but not limited to:

- **Future supply capacity relative to future demand**: The timing and magnitude of investment in bulk water and wastewater infrastructure will vary depending on rainfall, demand and existing supply capacity.

- **Cost effective options for augmentation**: The magnitude of costs to augment the capacity of the bulk water and wastewater network depends on the cost of the next best augmentation option. In some cities, where the availability of a suitable site for a major new wastewater treatment facility is limited, for example, the cost of supply augmentation will be relatively higher.

- **Current state of assets**: The current state of the asset network varies across cities. In some cities, the asset portfolio is older which will require more expenditure on infrastructure maintenance and renewal.

- **The rate of population growth**: The Australian Infrastructure Plan estimates that almost three-quarters of Australia’s population growth will occur in Sydney, Melbourne, Brisbane and Perth between 2011 and 2031 (IA, 2016). The magnitude of expenditure required to provide water and wastewater services to a growing population will invariably differ across cities depending on population and dwelling growth.

- **The spatial nature of population growth**: Population and associated dwelling growth can be accommodated either by infill or greenfield (urban sprawl) development. The balance between infield and greenfield development will affect capital and operating expenditure and will vary across cities.

There are also a number of assumptions that underpin the model that will mean the results are indicative only. For example, the model assumes an annual increase in capital and operating expenditure of 4.5 per cent per annum over the life of the analysis under the base case. In practice, capital expenditure will track up at a slower rate with large upticks where major supply capacity upgrades are undertaken. It is almost certain that the results will not reflect reality and it should be noted that the intention is not to provide definitive and precise future forecasts. Rather the model has been designed to indicate the potential trajectory of future bill impacts under various possible future expenditure increases.
While further analysis would be required to map the likely profile of capital and operating expenditure over time to improve confidence in the model results, if future capital and operating expenditure does increase in real terms, there is a strong case for governments to at least consider how urban water reform could reduce the impact of future bill increases.
Appendix B: Description of building blocks methodology

The term “building blocks” is commonly used to describe the approach used to calculate the efficient cost components that make up the revenue requirement to be recovered through water charges. The cost components or “building blocks” can vary but will generally include capital expenditure, operating expenditure and a return of on capital.

The “building blocks” approach is forward-looking and considers estimates of the future costs associated with providing the service. There is usually a clear link between the definition or level of the service (such as service standards and regulatory obligations), cost drivers (such as the number of customers, and number of connections) and forecast costs. Economic regulators use the building blocks approach to derive forward estimates of the revenue needed to permit a defined service to be delivered over the “pricing or regulatory period”. A summary of the building blocks approach is provided in Figure 18.

Source: Aither, based on NWI Steering Group on Water Charges, 2007
Note: For simplicity, the model will not take into account tax and a return on working capital

Figure 18 Summary of the building blocks approach

<table>
<thead>
<tr>
<th>Revenue requirement =</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating, maintenance &amp; administration expenditure + Return of capital (depreciation) + Return on capital (RAB x WACC) + Return on working capital and regulatory tax allowance</td>
</tr>
</tbody>
</table>

Setting the initial RAB

In most cases, economic regulators set the value of the respective RAB based on the economic value of the assets. The economic value reflects the Net Present Value (NPV) of future cash flows generated by the business, assuming that prices that prevailed at the time the valuation was undertaken are to continue. Once set, the RAB is not revalued. Rather, the RAB’s are adjusted to include a return on and of new capital expenditure.

RAB roll-forward

New investments and reinvestments (i.e. all new capital expenditure) are added to the RAB at efficient actual cost. Assets disposed of are deducted from the RAB, as is depreciation. Over time, as legacy assets are fully depreciated and replaced, the RAB increasingly reflects the depreciated replacement cost of assets.
# Appendix C: Regulatory Asset Base Values

<table>
<thead>
<tr>
<th>City</th>
<th>Economic Regulator</th>
<th>Utility</th>
<th>Ownership</th>
<th>Value* (RAB in 2015-16)</th>
<th>Water services (excludes wastewater services)</th>
<th>Bulk supply</th>
<th>Distribution</th>
<th>Retail</th>
<th>Fully integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australian Capital Territory</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canberra</td>
<td>Independent Competition and Regulatory Commission</td>
<td>Icon Water</td>
<td>State Government owned</td>
<td>~$2.3bn(^{16})</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td><strong>New South Wales</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sydney</td>
<td>Independent Pricing and Regulatory Tribunal</td>
<td>Sydney Water</td>
<td>State Government owned</td>
<td>~$14.5bn(^{17})</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>


### Urban water sector: future cost and affordability analysis

**City** | **Economic Regulator** | **Utility** | **Ownership** | **Value* (RAB in 2015-16)** | **Water services (excludes wastewater services)** |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>Independent Pricing and Regulatory Tribunal</td>
<td>WaterNSW</td>
<td>State government owned</td>
<td>$1.4bn(^{18\text{**}})</td>
<td>✓</td>
</tr>
<tr>
<td>Sydney</td>
<td>Independent Pricing and Regulatory Tribunal</td>
<td>Sydney Desalination Plant</td>
<td>Privately owned</td>
<td>~$1.8bn(^{19})</td>
<td>✓</td>
</tr>
<tr>
<td>Gosford / Wyong</td>
<td>Independent Pricing and Regulatory Tribunal</td>
<td>Gosford / Wyong council</td>
<td>Gosford / Wyong council</td>
<td>~$0.7bn (Gosford) ~$0.5bn (Wyong)(^{20})</td>
<td>✓ ✓</td>
</tr>
</tbody>
</table>

**Northern Territory**

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<table>
<thead>
<tr>
<th>City</th>
<th>Economic Regulator</th>
<th>Utility</th>
<th>Ownership</th>
<th>Value* (RAB in 2015-16)</th>
<th>Water services (excludes wastewater services)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bulk supply</td>
</tr>
<tr>
<td>Darwin</td>
<td>Utilities Commission</td>
<td>Power and Water Corporation</td>
<td>State Government owned</td>
<td>Not publicly available</td>
<td>✓</td>
</tr>
<tr>
<td>Queensland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metropolitan and regional areas of south east Queensland</td>
<td>Queensland Competition Authority</td>
<td>Seqwater</td>
<td>State Government owned</td>
<td>~$8.6bn(^{21})</td>
<td>✓</td>
</tr>
<tr>
<td>Brisbane</td>
<td>Queensland Competition Authority</td>
<td>Queensland Urban Utilities</td>
<td>Joint venture between five local councils</td>
<td>~$5.4bn(^{22***})</td>
<td>✓</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City</th>
<th>Economic Regulator</th>
<th>Utility</th>
<th>Ownership</th>
<th>Value* (RAB in 2015-16)</th>
<th>Water services (excludes wastewater services)</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td>Bulk supply</td>
</tr>
<tr>
<td>Sunshine Coast</td>
<td>Queensland Competition Authority</td>
<td>Unity Water</td>
<td>Joint venture between two local councils</td>
<td>~$3.5bn(^{23})*</td>
<td>✓</td>
</tr>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Redlands</td>
<td>Queensland Competition Authority</td>
<td>Redlands Water</td>
<td>Council owned</td>
<td>~$0.5bn(^{24})*</td>
<td>✓</td>
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<tr>
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</tr>
<tr>
<td>Gold Coast</td>
<td>Queensland Competition Authority</td>
<td>Gold Coast Water</td>
<td>Council owned</td>
<td>~$2.8bn(^{25})*</td>
<td>✓</td>
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</tr>
<tr>
<td>Logan Council</td>
<td>Queensland Competition Authority</td>
<td>Logan Water</td>
<td>Council owned</td>
<td>~$1.4bn(^{26})*</td>
<td>✓</td>
</tr>
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<table>
<thead>
<tr>
<th>City</th>
<th>Economic Regulator</th>
<th>Utility</th>
<th>Ownership</th>
<th>Value* (RAB in 2015-16)</th>
<th>Water services (excludes wastewater services)</th>
<th>Bulk supply</th>
<th>Distribution</th>
<th>Retail</th>
<th>Fully integrated</th>
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<td>South Australia</td>
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<td></td>
</tr>
<tr>
<td>Adelaide</td>
<td>Essential Services Commission of South Australia</td>
<td>SA Water</td>
<td>State Government owned</td>
<td>~$11.4bn&lt;sup&gt;27&lt;/sup&gt;</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Tasmania</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Hobart</td>
<td>Tasmanian Economic Regulator</td>
<td>TasWater</td>
<td>Jointly owned by 29 Tasmanian councils</td>
<td>~$3bn&lt;sup&gt;28&lt;/sup&gt;</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Victoria</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melbourne</td>
<td>Essential Services Commission</td>
<td>Melbourne Water</td>
<td>State Government owned</td>
<td>~$9.8bn&lt;sup&gt;29&lt;/sup&gt;</td>
<td>✓</td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>City</th>
<th>Economic Regulator</th>
<th>Utility</th>
<th>Ownership</th>
<th>Value* (RAB in 2015-16)</th>
<th>Water services (excludes wastewater services)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melbourne</td>
<td>Essential Services Commission</td>
<td>City West Water</td>
<td>State Government owned</td>
<td>~$1.7bn&lt;sup&gt;30&lt;/sup&gt;</td>
<td>Bulk supply: ✓  Distribution: ✓  Retail: ✓  Fully integrated: ✓</td>
</tr>
<tr>
<td>Melbourne</td>
<td>Essential Services Commission</td>
<td>South East Water</td>
<td>State Government owned</td>
<td>~$3.1bn&lt;sup&gt;31&lt;/sup&gt;</td>
<td>Bulk supply: ✓  Distribution: ✓  Retail: ✓  Fully integrated: ✓</td>
</tr>
<tr>
<td>Melbourne</td>
<td>Essential Services Commission</td>
<td>Yarra Valley Water</td>
<td>State Government owned</td>
<td>~$3.6bn&lt;sup&gt;32&lt;/sup&gt;</td>
<td>Bulk supply: ✓  Distribution: ✓  Retail: ✓  Fully integrated: ✓</td>
</tr>
</tbody>
</table>

**Western Australia**

---

<table>
<thead>
<tr>
<th>City</th>
<th>Economic Regulator</th>
<th>Utility</th>
<th>Ownership</th>
<th>Value* (RAB in 2015-16)</th>
<th>Water services (excludes wastewater services)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bulk supply</td>
</tr>
<tr>
<td>Perth</td>
<td>Economic Regulatory Authority</td>
<td>Water</td>
<td>State Government owned</td>
<td>~$13.1bn***</td>
<td>✓</td>
</tr>
</tbody>
</table>

Note: * Values provided are the RAB for each entity and include water and wastewater.
** RAB presented for Greater Sydney (i.e. ex Sydney Catchment Authority).
*** 2014-15 values indexed to $2016 and updated to include additional capital expenditure and deduct depreciation.
**** Note, $2005 value from 2009-2015 determination indexed to $2016 and updated to include additional capital expenditure and deduct depreciation.

Document history

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<tr>
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<td>Rod Coulton</td>
</tr>
<tr>
<td>Checked</td>
<td>Will Fargher, Nick Clarke</td>
</tr>
<tr>
<td>Approved</td>
<td>Will Fargher</td>
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We acknowledge:

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<tr>
<th>Person</th>
<th>Role</th>
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<tbody>
<tr>
<td>Stuart Wilson and Diane Nolder</td>
<td>Assisted in testing and refining assumptions and data inputs.</td>
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