NSW GOVERNMENT | Treasury

June 2021

2021 Intergenerational Report

Technical note and sensitivity tables

Preface

This technical note covers selected aspects of the modelling and assumptions underlying the 2021 NSW Intergenerational Report (IGR). The note also covers key modelling sensitivities.

The IGR's core modelling is consistent with that presented in the 2016 NSW Intergenerational Report Technical Note. This core modelling is also supported by a series of technical research papers released by NSW Treasury throughout 2020 and 2021, detailing significant updates and extensions to the IGR's modelling since the last report. This note references published modelling analysis where appropriate.

This note does not comprehensively cover all technical aspects of the IGR's modelling methodology. Rather, it offers additional details on certain aspects of the modelling which are either new to this year's IGR or judged to be of interest to a broader audience. This includes the climate change and energy analysis in this year's report.

Acknowledgement

NSW Treasury acknowledges the Traditional Owners of the land on which we live and work, the oldest continuing cultures in human history.

We pay respect to Elders past and present, and the emerging leaders of tomorrow.

We celebrate the continuing connection of Aboriginal and Torres Strait Islander peoples to Country, language and culture and acknowledge the important contributions Aboriginal and Torres Strait Islander peoples make to our communities and economies.

We reflect on the continuing impact of policies of the past, and recognise our responsibility to work with and for Aboriginal and Torres Strait Islander peoples, families and communities, towards better economic, social and cultural outcomes.

Contents

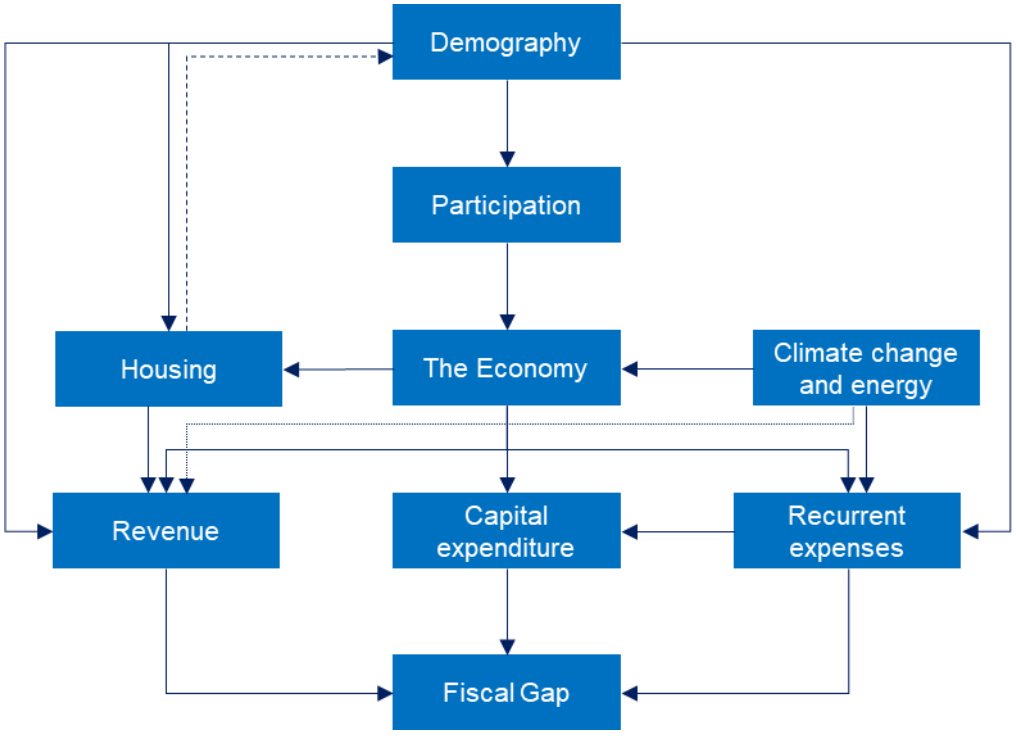
1. The Long-Term Fiscal Pressures Model

Overview

NSW Treasury's assessment of the State's long-term fiscal pressures is underpinned by the Long-Term Fiscal Pressures Model (LTFPM). This demographic-economic model has been developed by NSW Treasury to project trends in general government expenses, revenues, and capital expenditure over the next 40 years. These trends are projected on the basis there is no change in current government policy and historical economic and demographic trends persist. The model does not forecast the State's long-term budgetary position. Rather, the model projects what might occur absent changes to government policy.

The LTFPM is underpinned by the "3-P's framework"; that is, economic growth over the long term is driven by **population** and the age composition (which determines the working age population), **participation** (the size of the labour force) and **productivity** (the efficiency with which the labour force produces output). The LTFPM also captures the impact of an ageing population on the State's long-term economic and fiscal outlook. It is comprised of a series of interconnected economic, demographic, and fiscal modules, outlined in Figure 1.

Figure 1: The Long-Term Fiscal Pressures Model



The **demography** module is at the centre of the model - driving all the economic and fiscal projections that follow. This module includes a no-ageing scenario that holds the age profile of the population constant relative to the size of the population from 2018-19 onwards. This allows the impact of ageing on the economy, revenues and expenses to be estimated over the 40-year projection period.

The **participation** module projects trends in participation rates across gender, age, and type of employment (full-time and part-time). Participation rate modelling informs projections of employment and hours worked. When combined with **population** projections and a **productivity** growth

assumption this generates Gross State Product projections over the 40-year horizon (the 3-P's framework). This process is described in the Economy section.

The **housing** module, first developed for the 2016 version of the model, and described in the technical note accompanying the 2016 NSW Intergenerational Report, has been retained. This module is used to project housing supply and dwelling prices. This module interacts with the demographics module allowing for the analysis of the demographic, economic and fiscal impacts of housing supply changes. This sensitivity analysis is not presented in this note but may inform future reports as well as advice to Government.

The 2021 version of the LTFPM includes **climate change and energy transition** analysis. The fiscal and economic impacts of climate change[1] and energy transition paths[2] are now captured within the model.

The three fiscal modules (**revenue, capital expenditure and recurrent expenses**) are shown at the bottom of Figure 1. These modules combine to produce projections of the State's primary balance and the fiscal gap, which flow into projections of gross and net debt. These modules produce projections for each category of government revenue and expenditure, allowing for a detailed analysis of future fiscal pressures.

The base year

The fiscal gap is a measure of the long-term fiscal pressures facing New South Wales. It is defined in the *Fiscal Responsibility Act 2012* as the projected change in general government sector revenues less expenditures on the basis of no policy changes — including net capital expenditure but excluding interest —between the base year and the last year of the projection period, as a percentage of Gross State Product GSP). In short, the fiscal gap is the change in the primary balance share of the economy over the projection period.

If the convention of previous IGRs were followed, the timeframe for calculating the fiscal gap would suggest a base year of 2019-20 (the last year for which historical data is available) and final year of 2060-61. However, 2019-20 includes the impact of a once-in-a-generation global shock, in the COVID-19 pandemic, as well as the impact of drought and bushfires. These temporary economic and fiscal shocks distort the primary balance in 2019-20, and consequently distort the fiscal gap. The fiscal gap would be robust to the choice of base year were it not for the exceptional economic circumstances presented by 2019-20.

The distortion can be alleviated by using 2018-19 as the base year instead. This is a robust yet simple alternative that falls within the timeframes specified by the legislation governing fiscal gap reporting.[3]

[1] Refer to the following paper for more information on climate change modelling: NSW Treasury, **An indicative assessment of four key areas of climate risk** for the 2021 NSW Intergenerational Report 2021, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-05, 2021.

[2] Refer to the following paper for more information on the energy model: NSW Treasury, **The sensitivity of the NSW economic and fiscal outlook to global coal demand and the broader energy transition** for the 2021 NSW Intergenerational Report, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-07, 2021

[3] Refer to the following paper for details on how the fiscal gap is measured and how the base year was selected: NSW Treasury, **Measuring and reporting fiscal pressures**, Intergenerational Report Explanatory Paper, 2021.

2. Demography

Modelling methodology

The demography module contains population projections to 2060-61 for New South Wales and Australia as at the 2020-21 Half-Yearly Review. Projections are produced using a cohort component method, which breaks the population down by single year of age and gender, based on assumptions about future demographics trends. Population projections are a function of fertility, mortality, and net migration (international and interstate arrivals less departures), where:

$$Population_{t+1} = Population_t + Births_{t+1} - Deaths_{t+1} + Migrant\ arrivals_{t+1} - Migrant\ departures_{t+1}$$

- **Mortality** rates: The Lee-Carter method is used to project mortality rates and life expectancy. This method extrapolates historical rates of mortality decline by single year of age and gender. The full details of this approach can be found in the 2016 NSW Intergenerational Report Technical Note.
- The Total **Fertility** Rate (TFR): This represents the average number of children that would be born per woman over their lifetime, assuming current age-specific fertility rates are held constant. The fertility rate assumptions in this Report have been formed through a combination of historical trends analysis, a review of academic and international literature, and qualitative and quantitative analysis by Professor Peter McDonald on behalf of the Commonwealth Treasury.[4]
- Net interstate **migration** levels and the State's share of net overseas migration are projected to return to their long-run average levels. For net interstate migration this is an annual net loss of 17,500 people to other states and territories. New South Wales is projected to receive net overseas migrants in proportion to its resident population share. The national long-run net overseas migration level is consistent with the Commonwealth Government's assumption of 235,000 per annum.[5]

Demographic modelling sensitivities

The sensitivity analysis presented assesses the response of population parameters to changes in fertility and overseas migration.

Table 1 shows that in both sensitivities, the aged dependency ratio changes, but in different directions. Higher migration and fertility lift both the proportion of the population of traditional working age (15-64), as well as those aged under 15, and therefore lower the aged dependency ratio. Lower migration and fertility have the opposite effect and increase the aged dependency ratio.

[4] Refer to the following paper for information on modelling of the TFR: NSW Treasury, **Preliminary Fertility Rate Projections** for the 2021 NSW Intergenerational Report, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-01, 2021.

[5] Centre for Population 2020, Population Statement, the Australian Government, Canberra.

Table 1: Population Sensitivity

	Demographic parameter*	1981	2019	2061 Low	2061 Base	2061 High
Inputs	NSW Fertility Rate	1.94	1.70	1.53	1.63	1.73
	National net overseas migration (000s)	119	241	210	235	260
Population (000s)	Total NSW population	5,235	8,087	10,892	11,463	12,049
	Under 15	1,271	1,499	1,556	1,739	1,932
	15-64	3,436	5,268	6,473	6,839	7,211
	65 and over	528	1,321	2,864	2,885	2,906
Proportion (%)	Under 15	24.3	18.5	14.3	15.2	16.0
	15-64	65.6	65.1	59.4	59.7	59.8
	65 and over	10.1	16.3	26.3	25.2	24.1
Ratios	Aged dependency ratio[(A)]	15.4	25.1	44.2	42.2	40.3
	Youth dependency ratio[(B)]	37.0	28.5	24.0	25.4	26.8
	Total dependency ratio[(C)]	52.4	53.5	68.3	67.6	67.1

* Note that population data is as at 30 June of the relevant year.

(A) The ratio of people aged 65 and over to those between 15 and 64.

(B) The ratio of those under 15 to those between 15 and 64.

(C) The ratio of those under 15 and over 64 to those between 15 and 64.

3. Economy

Economy modelling methodology

The economic module projects key economic parameters for New South Wales over the next 40 years. These projections utilise the 3-P's framework for assessing population, participation, and productivity.

- Population and its age composition determine the working age population.
- The participation rates of the working age population (those aged 15 and over) determine the size of the labour force (this includes people in employment and those looking for work). The composition of employment, full-time versus part-time, combined with average hours worked determines the total hours worked in New South Wales.
- Productivity is the output per hour worked. Total hours worked and productivity give real Gross State Product.

Economic parameters in the Long-Term Fiscal Pressures Model are projected on an annual basis beginning with the last available year of historical data (2019-20). The next 5 years (2020-21 to 2024-25) are populated using NSW Treasury's short-term forecasts.[6] The model than transitions the NSW economy to equilibrium by 2028-29. It does this by closing the output gap and moving the economy to full employment. At this point, key economic parameters return to their long-run values:

- Consumer Price Index (CPI) growth of 2.5 per cent per annum – consistent with the mid-point of the Reserve Bank of Australia's target band.
- Equilibrium wage growth of 3.7 per cent – consistent with long-run CPI and productivity growth assumptions.
- Full employment, as measured by the Non-Accelerating Inflation Rate of Unemployment (NAIRU), is expected to occur at an unemployment rate of around 4½ per cent.
- The long-run projected cash rate is a function of Australian real GDP growth, the Reserve Bank of Australia's inflation target, and an assumed spread against the standard variable lending rate.
- Average weekly full-time and part-time hours remain constant after the forward years at 38.1 and 17.1 hours, respectively. Total hours worked are projected based on the changing share of people in full-time and part-time employment.

Participation

The workforce **participation** rate projects the size of the labour force as the share of people (aged 15 and over) who are employed or seeking employment. Projections are produced on an annual (fiscal year) basis. Participation rate projections are a function of:

- Projections of full and part-time participation rates by five-year age and gender cohorts; and
- Projections of the age composition of the population.

Cohort participation rate projections are consistent with those outlined in the Treasury Technical Paper - Preliminary Participation Rate Projections for the 2021 Intergenerational Report. These

[6] As of the 2020-21 Half-Yearly Review

annual projections are based off historical data to 2018-19. Although 2019-20 historical data has since become available, these participation rate outcomes were significantly impacted by the COVID-19 pandemic. Based on more recent labour market data, these impacts appear to have been temporary with participation rates generally returning to pre-COVID-19 levels as economic and labour market conditions have improved. Therefore, to avoid the distortionary effects of including 2019-20 outcomes, the historical data series used as the basis of projections ends in 2018-19.

These cohort projections are then combined with NSW Treasury's 2021 IGR population projections to produce projections of aggregate annual participation rates to 2060-61 for New South Wales and Australia.[7]

Productivity growth

Labour productivity is calculated as the ratio of GSP to hours worked. Long-run NSW annual labour productivity is assumed to grow in line with the 30-year historical average growth rate (1.2 per cent). This assumes an increase from the 20-year historical annual average growth of 0.9 per cent and the 10-year historical annual average growth of 0.7 per cent. This assumes that productivity growth over the projection period will be similar to the historical pattern and will likely include periods of higher growth as well as periods of lower growth. Conditions that have led to subdued productivity growth in New South Wales over the past 20 years are assumed to improve over the projection period.

This methodology was reviewed as part of the 2021 NSW Intergenerational Report and is consistent with the approach taken in the 2016 NSW Intergenerational Report. The review of methodology[8] found that applying a long-run historical average is consistent with international best practice. It also underscored the complexity associated with quantifying the contributions of the drivers of productivity growth and the inherent uncertainty in projecting the growth of these drivers. The long-run annual growth rate used in the 2021 Intergenerational Report of 1.2 per cent is below the 1.3 per cent used in the Technical Paper. This downward revision reflects updated data from the 2019-20 ABS National Accounts.

National-level productivity is assumed to grow at be the same rate as in New South Wales. In 2018-19 productivity in New South Wales was roughly equal to the national level indicating convergence of productivity levels.

Economy modelling sensitivities

Tables 2 and 3 below show the sensitivity of the fiscal gap to changes in productivity growth assumptions and participation rate projections. As with the 2016 IGR, the base case uses real Gross State Product per capita as a proxy for real income growth to measure the change in demand for services as incomes change. All else being equal, faster growth in real GSP per capita would lead to faster growth in services expenditure. However, consistent with the 2016 IGR, the sensitivity analysis assumes that changes to GSP per capita (as a result of changes in productivity growth or participation) does not impact demand for government services. Therefore, for the purposes of Table 2 and 3, expenses do not respond to changes in real income growth. The results below show how

[7] For further information on NSW Treasury's approach to the modelling of participation rates, refer to: NSW Treasury, **Preliminary Participation Rate Projections for the 2021 Intergenerational Report**, Intergenerational Report Treasury Technical Research Paper Series, 2021.

[8] Refer to the following paper for details: NSW Treasury, **Projecting Long Run Productivity Growth Rates for the 2021 NSW Intergenerational Report**, Intergenerational Report Treasury Technical Research Paper Series, 2021.

sensitive the fiscal gap is to changes in economic growth, when the connection between real income growth and demand for government services is held unchanged relative to the base case.

Labour productivity is the principal driver of economic output, real income and living standards. Table 2 summarises the economic and fiscal gap impacts from a 0.1 percentage point variation in long-run productivity growth above and below the base case.

Table 2: Productivity growth sensitivity

Units Time period(s)	% CAGR 2018-19 to 2060-61	% CAGR 2018-19 to 2060-61	In base year $ 2019-20 2060-61	Per cent of GSP 2060-61	Per cent of GSP 2060-61
Long-run growth assumption	Real GSP	Real GSP per capita	Real GSP per capita	Fiscal gap (ex-NGF[9])	Net debt (incl-NGF)
Base case Productivity of **1.2%** per annum	1.97	1.11	125,600	2.6	99.9
High case Productivity of **1.3%** per annum	2.06	1.21	130,800	2.3	96.0
Low case Productivity of **1.1%** per annum	1.87	1.02	120,600	2.9	103.9

The participation rate drives labour force growth and hours worked, and therefore economic output. Table 3 summarises the economic and fiscal gap impacts from a 1 percentage point increase or decrease in the participation rate relative to the base case. In both the high and low case, the participation rate differential to the base case is held constant at 1 percentage point after 2030-31. It also includes a scenario where the women's participation rate increases to reach the same level as that of men over 20 years and then remains at the same level thereafter. This scenario is illustrative only and does not account for any costs associated with changes in participation.

Table 3: Participation rate sensitivity

Units Time period(s)	% CAGR 2018-19 to 2060-61	% CAGR 2018-19 to 2060-61	Per cent 2060-61	Per cent of GSP 2060-61	Per cent of GSP 2060-61
Participation rate assumption	GSP	Real GSP per capita	Participation rate	Fiscal gap (ex-NGF)	Net debt (incl-NGF)
Base case	1.97	1.11	61.6	2.6	99.9
High case +1 ppt higher by 2030-31	2.01	1.15	62.6	2.4	95.8
Low case -1 ppt lower by 2030-31	1.93	1.08	60.6	2.7	104.2
Women's participation Increases to become equal to men by 2040-41	2.15	1.29	66.3	1.9	86.4

[9] 'NGF' in the sensitivity tables refers to the NSW Generations Fund

4. Expenditure

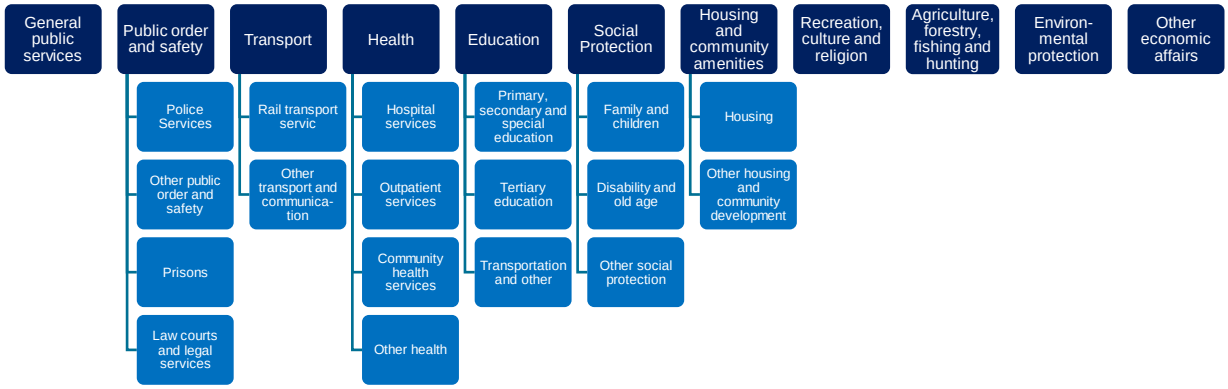
General government expenditure is projected on a no-policy change basis. Projections reflect the ongoing impact of long-term underlying economic and demographic trends. Government expenditure is broken down into two categories:

- Recurrent expenses – the ongoing expenditure associated with the delivery of public services (including wages and salaries)
- Capital expenditure – the expenditure that increases the State's capital stock. This includes expenditure to build, acquire or upgrade physical assets such as transportation systems, hospitals, and schools.

Recurrent expenses modelling methodology

Historical state government expense data is sourced from the Australian Bureau of Statistics (ABS). ABS Government Finance Statistics break down expenses by the purpose for which the funds are used. [10] The modelling approach used by the 2021 IGR groups expense categories as shown in Figure 2.

Figure 2: IGR expense categories and sub-categories



Historical expense growth within each sub-category can be largely attributed to the three primary drivers of nominal economic growth:

- Population growth
- Gross State Product per capita (used as a proxy for real income growth) to measure the change in demand for services as incomes change
- Price Growth

The 2021 IGR assumes that the real income elasticity of government expenses is one. This means that public sector expenses (per capita) increase in line with income growth (per capita).

There are two other known factors that drive expense growth:

[10] Interest transactions are excluded from expense modelling. Interest transactions include interest earned, as well as the borrowing costs associated with debt.

- Changes in the demographic composition of the NSW population
- Identified NSW government policy changes

Expense growth drivers, that are not explicitly identified, are treated as 'other growth factors'. The next section explains how these factors are derived and used to project expenses.

Historic expense growth for each category of government expenditure can be modelled as follows:

$$\frac{E_{t+1}^{i}}{E_{t}^{i}} = \frac{GSP_{t+1}}{GSP_{t}} \cdot \frac{POP_{t+1}^{i}}{POP_{t}^{i}} \cdot \frac{CPI_{t+1}}{CPI_{t}} \cdot \frac{OGF_{t+1}^{i}}{OGF_{t}^{i}} \cdot \left(1 + PolicyGrowth_{t+1}^{i}\right)$$

Each term captures the growth factor (between time t and $t+1$) associated with that parameter.

- E_t^i is government recurrent expenditure in category i at time t
- GSP_t is real Gross State Product per capita at time t
- POP_t^i is the estimated resident population of the State weighted by the demographic composition of public services demand for category i at time t (see later discussion on age-cost indices)
- CPI_t is Sydney's Consumer Price Index at time t
- $PolicyGrowth_{t+1}^i$ captures announced government policy decisions for expense category i at time t. The IGR methodology defines a new policy measure as a policy decision that cannot be attributed to economic, demographic factors or CPI. For example, in education, a decision to decrease class sizes would be a policy change, whereas the opening of a new school to meet population growth would not.
- The OGF $(other\ growth\ factor)$ term is a residual – designed to captured cost pressures, in a specific expense category, that are not already captured by any of the other factors.

Other growth factors (OGFs)

OGF's are calculated using historical data for each functional expense area. Any variation in expenditure growth not explained by either the known demographic or economic factors, or the identified policy changes, will be included in the OGF.

This term is a catch-all variable that captures trends such as those associated with changes in technology, community expectations, other non-demographic demand factors, or even cost pressures that differ from overall inflation. The OGF also captures the impact of unidentified smaller policy changes. These changes are referred to as 'policy drift' as they reflect expense trends that occur without an identified policy decision or known factor as a driver.

The historical data used to calculate the OGFs is sourced from ABS Government Finance Statistics for the period 1978-79 to 2018-19. This dataset provides a consistent basis to measure expenses by policy function, rather than by agency, making it robust to machinery of government changes. The categorisation of government expenditure has changed over this historical period from a classification known as Government Purpose Classification (GPC) to an international-consistent standard referred to as the Classification of the Functions of Government - Australia (COFOG-A). Historic expenditure data between 1998-99 to 2018-19 is available on a COFOG-A basis while data prior to 1998-99 is available on a GPC basis only.

GPC and COFOG-A data were mapped to the appropriate IGR expense categories shown in Figure 2. The OGFs for each of these functional areas were calculated separately for the period

between 1978-79 and 1997-98 and the period between 1998-99 to 2018-19. The OGF for each period was obtained by:

- Constructing an index for the component of expense growth not explained by the other drivers
- Fitting a logistic growth function to this index to estimate the growth rate of the OGF

The final OGF for each expenditure category is the weighted average of the OGFs from the two periods. The weight for the 1978-79 to 1997-98 period was 37 per cent while the weight for the latter period was 63 per cent – reflecting a higher individual weight given to more recent years (consistent with previous IGRs). These OGFs are then held constant over the projection period (2019-20 to 2060-61) for each of the expense sub-categories.

The OGFs for each major expense category are shown in Table 4. The OGFs capture the extent to which cost pressures in each category have differed from underlying economic and demographic factors. They also capture the increase in demand for services not explained by announced policy decisions.

Table 4: Other growth factors

Expense Category	2016 IGR (per cent)	Current (per cent)
General Public Services	-	-
Public Order and Safety	0.2	0.3
Education	0.0	0.1
Health	0.4	0.6
Social Security and Welfare	0.5	0.9
Housing and Community Amenities	-0.7	-1.0
Recreation and Culture	0.1	0.2
Agriculture, Forestry, Fishing and Hunting	-1.3	-1.3
Transport and Communications	-	-0.1
Environmental Protection	N/A	0.3
Other	-	-
Total (forward weighted)	**0.3**	**0.3**

The concordance between GPC expense data and COFOG-A data is not one-for-one. Although efforts have been made to ensure IGR expenditure categories remain consistent through the change from GPC to COFOG-A, this is not always technically possible. For instance, the 2021 IGR includes the Environmental Protection category, which was introduced as part of the switch to COFOG-A. This category includes expenditure that would have previously been included in other categories such as Housing and Community Amenities.

Care should be taken when making direct comparisons between the 2021 OGFs and the 2016 OGFs – which were calculated using GPC data only. That said, the current OGFs are broadly consistent with those reported in the 2016 Report – as is the projected total (weighted) OGF at 0.3 per cent. The projected total OGF can be interpreted as the extent by which general government expenses will grow above demographic and economic factors over the next forty years, ignoring policy changes.

Age cost indices (ACIs)

A key driver of recurrent expense growth is total population growth. All else being equal, more people residing in New South Wales means greater demand for government services. However, there are

some categories of expenditure that will experience substantively higher or lower growth depending on the demographic composition of this demand and associated service provision costs.

For this reason, expense categories are separated into two groups:

1. Age sensitive – where there is variation in the demand or cost of providing these services across age cohorts, such as health and education.
2. Not age sensitive – for categories where demand for services is expected to broadly grow in-line with total population growth, such as transport services.

For age-sensitive areas of recurrent spending, the IGR modelling approach uses age-cost indices to identify the annual increase in expenses due to demographic composition change. This is calculated by taking the weighted sum of the population by age cohorts, using the age-cost index values as the weights. The growth rate of this weighted population calculation combines the effects of population growth and demographic change. The demographic compositional effect can then be isolated by subtracting the total (unweighted) population growth from the growth rate of the weighted population.

Age cost indices are developed using data on the use and cost of usage across an expense category for specified age cohorts. The use and average cost of service provision for each age cohort is determined for each 'age sensitive' subcategory using historical data to create an age-cost index. The index is then normalised across age cohorts such that the index sums to 100. Details on the derivation of these age-cost indices has been previously published in in the 2016 NSW Intergenerational Report Technical Note.

Although considerable effort was made to establish that the age-cost indices are representative of all expenses and are stable over time, the data used to create them are not available for all expense components over the whole historical period. Some aspects of their coverage and stability remain based on assumptions.

For most age-sensitive cost categories, the profile of the age cost index is held constant across the projection period (i.e. a static index). However, for the health expense sub-categories, a detailed analysis[11] found the use of a dynamic age-cost index (broken down by gender) to be a more appropriate means to assess demographics cost pressures.

The data sources for deriving age-cost indices for age sensitive expense categories is shown in Table 5.

Table 5: Age-cost indices

Expense category	Sub-category	Source
Public Order and Safety	Prisons and corrective services	NSW Bureau of Crime Statistics and Research Productivity Commission - Report on Government Services 2020 (unit cost data)
Education	Primary and secondary school education	ABS 4221.0 Schools, Australia, 2019 NSW Department of Education and NSW Treasury (unit cost data)
	Tertiary education	National Centre for Vocational Education Research VOCSTATS

[11] Refer to the following paper for more information: NSW Treasury, **Ageing and health expenses in New South Wales – revisiting the long-term modelling approach**, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-05, 2021.

Expense category	Sub-category	Source
	Transport of school students	ABS 4221.0 Schools, Australia, 2019
Health	Hospital services	
	Outpatient services	National weighted average unit cost per 5-year age cohort (Ministry of Health)
	Community Health Services	
Social Security and Welfare	Family and Child Welfare Services	NSW Department of Communities and Justice and NSW Treasury
	Welfare Services for the Aged and Disabled	NSW Treasury
	Other Social Security and Welfare	Based on proportion of expenditure restricted to over 65s

Capital expenditure modelling methodology

Capital stock and expenditure data for the general government sector is broken down into COFOG-A categories (as was done for recurrent expenses). A key difference is that this data is not available from the ABS and is instead sourced from internal NSW Treasury systems. Data within each COFOG-A category is broken down into land capital and non-land capital.

The first 10 years (2020-21 to 2029-30) of the capital expenditure profile for each expense category is based on known agency capital expenditure plans, which are assigned to a COFOG-A category based on the activity each agency is primarily engaged. This is split into land and non-land components using historical ratios. The planned annual capital expenditure over the decade has been smoothed to remove the peaks and troughs associated with planned infrastructure expenditure, with the smoothed aggregate expenditure over the 10-year period for each category equal to the actual expenditure plans for that period. The other capital flows over this period, such as disposals and depreciation, are modelled with respect to historical ratios and relationships.

These capital flows are used to derive the capital stock for both land and non-land capital using this equation:

$$K_{t+1} = K_t(1-\delta) + C_{t+1} - D_{t+1} + R_{t+1}$$

Where nominal capital stock in the next time period (K_{t+1}) is equal to:

- the capital stock in the last time period less depreciation $K_t(1-\delta)$
- plus any new capital expenditure less any disposals/sales $C_{t+1} - D_{t+1}$
- plus any revaluation of the capital stock and other movements R_{t+1}

Beyond 2029-30, capital expenditure is modelled on the basis that the capital intensity of government service delivery will remain constant for each category of government expenditure over the remainder of the projection period. This means that the capital stock, for each category, grows in the line with recurrent expenses (in real terms). This assumption holds for all expense areas except for Transport. As Transport expenditure is mostly capital in nature and tends to drive recurrent expenditure, it is assumed that over the long-run, Transport capital stock grows in line with economic growth (in real terms).

The full details of the general approach to modelling capital expenditure can be found in the 2016 NSW Intergenerational Report Technical Note.

Expense modelling sensitivities

The tables below show the sensitivity of the fiscal gap to changes in morbidity.

Table 6: Morbidity sensitivity[12]

Units	% CAGR	Per cent	Per cent of GSP	Per cent of GSP
Time period(s)	2018-19 to 2060-61	2060-61	2060-61	2060-61
Sensitivity	Health expenses	Health expenses share of GSP	Fiscal gap (ex-NGF)	Net debt (incl-NGF)
Base case Dynamic age cost indices	5.38	5.58	2.6	99.9
High case Unhealthy ageing[13]	5.60	6.09	2.9	106.4
Low case Healthy ageing [14]	5.25	5.29	2.4	96.2

[12] These results have been modelled using the same methodology outlined in the following paper: NSW Treasury, **Ageing and health expenses in New South Wales – revisiting the long-term modelling approach**, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-05, 2021.

[13] The unhealthy ageing scenario reflects a 10 percent decrease in the ratio of healthy life expectancy to life expectancy over the 40 year period.

[14] The healthy ageing scenario reflects a 10 per cent increase in the ratio of healthy life expectancy to life expectancy over the 40 year period.

5. Revenue

Revenue modelling methodology

The projections of NSW Government revenues assume no changes to current policy settings. Revenues are projected for State taxation, non-tax State revenue (sales of goods and services, dividends and income tax equivalents (ITEs), and royalties & other) and Commonwealth government grants (GST and tied grants). The underlying methodology for projecting revenue heads is largely consistent with the 2016 IGR – Table 6 describes the key drivers of each revenue head and any changes to the modelling approach since 2016.

Table 6: Revenue modelling approaches

Revenue line	Drivers	Methodology changes since the 2016 IGR
Transfer duty (residential)	• Estimated residential population, by age cohort • Estimated propensity to transact for each age cohort • House prices	The estimated allowance for bracket creep has been removed. Treasury studies suggested this term introduced downward bias whenever CPI inflation was higher than house price growth. Furthermore, transfer duty brackets are now indexed to consumer prices.
Transfer duty (non-residential)	• Observed relationship with residential transfer duty • 10-year Commonwealth Government bond yields	A model linking residential and non-residential transfer duty outcomes, after financing costs, has been implemented.
Land tax	• House prices • Housing stock	The administration of Land Tax is proxied using a three-year average of house price growth.
Payroll tax	• NSW Compensation of Employees • Policy costs	None. However, the impacts of payroll tax policies introduced since the 2016 IGR have been included.
Hotel and club gaming	• Wage Price Index	None
Other gaming	• Wage Price Index	None
GST	• Nominal GDP • Household Consumption • Dwelling investment • Population	The GST pool previously grew by nominal GDP. This is now projected based on the empirical relationship between household consumption, dwelling investment and the share of consumption that incurs GST. This methodology assumes that consumption and dwelling investment grow in line with nominal GDP, while the share of taxable consumption declines until 2030-31 before remaining unchanged.
Insurance duty	• House prices • Impacts of ageing	None
Mineral royalties	• Global demand and capacity	Details on how this was modelled can be found in the published technical paper[15]
SOGS	• Modelled Individually	None
National Partnerships	• Modelled Individually	None
Health SPP	• Health recurrent expenses	Modelling updated to reflect the 2020-2025 National Health Reform Agreement. Health SPP revenue is indexed to health recurrent expense growth over the projection period.

[15] The energy modelling is described in more detail in NSW Treasury, **The sensitivity of the NSW economic and fiscal outlook to global coal demand and the broader energy transition** for the 2021 NSW Intergenerational Report, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-07, 2021.

Education SPP	• CPI • WPI • Enrolment Growth	Modelling is consistent with the Australian Education Act 2013
Health Insurance	• Health Insurance Coverage • Indexation Rate (WPI and CPI)	None
Waste and Environment Levy	• Revenue projected to grow at 1.0 per cent consistent with EPA figures	None
Motor vehicle stamp duty	• Nominal GSP	None
Weight tax	• Nominal GSP	None

Climate and energy modelling

Climate and energy modelling is limited to assessing the sensitivity of the economy and budget outlook to changes in the baseline assumptions. The modelling starts with a technical assumption that the climate will change in line with the Intergovernmental Panel on Climate Change's (IPCC's) Representative Concentration Pathway (RCP) 4.5 scenario, in which global average surface temperatures increase by 1.4°C by 2060 compared to the 1986-2005 average. This is assumed to be consistent with the baseline 3Ps projections used in the LTFPM.

Under all climate scenarios, the climate module determines expenses and reimbursements (from the Commonwealth) under the Disaster Recovery Arrangements (DRA). CGE modelling is used to assess the overall impact of different warming scenarios (corresponding to the IPCC's RCP2.6 and RCP8.5) with respect to the four key risks modelled on the overall size of the NSW economy. The results of the CGE modelling are input into the LTFPM by means of altering the productivity assumption. This is combined with an alternative DRA expense and reimbursement projection to determine the fiscal impact of the four climate shocks under the alternative warming scenarios.[16]

The energy modelling adopts the same conceptual approach as the climate modelling. Three energy scenarios are considered in the Report in addition to the baseline scenario. The higher and lower global coal demand scenarios impact coal production only, while the slow and disorderly energy transition scenario considers electricity generation and electric vehicles uptake while incorporating the central coal production projection. Projected coal volumes under the coal scenarios are directly input into the revenue module in the LTFPM, while economic impacts under the three key scenarios are determined through CGE modelling and input into the LTFPM by means of a productivity shock. As coal revenues are diverted into the NSW Generations Fund (NGF), the fiscal gap *including* the NGF is significantly more sensitive to differing coal production scenarios than the fiscal gap *excluding* the NGF.[17]

[16] The climate modelling is described in detail in NSW Treasury, **An indicative assessment of four key areas of climate risk for the 2021 NSW Intergenerational Report**, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-05, 2021

[17] The energy modelling is described in more detail in NSW Treasury, **The sensitivity of the NSW economic and fiscal outlook to global coal demand and the broader energy transition for the 2021 NSW Intergenerational Report**, Intergenerational Report Treasury Technical Research Paper Series, TTRP 21-07, 2021

Table 6: Climate and energy sensitivities

Units Time period(s)	% CAGR 2018-19 to 2060-61	Per cent of GSP 2060-61	Per cent of GSP 2060-61	Per cent of GSP 2060-61
Scenario	Real GSP	Fiscal Gap (inc. NGF)	Fiscal gap (ex-NGF)	Net debt (incl-NGF)
Base case	1.97	0.57	2.56	99.9
Higher Warming (RCP8.5)	1.96	0.59	2.58	99.4
Lower Warming (RCP2.6)	1.97	0.50	2.47	98.4
Higher Global Coal Demand	1.97	0.35	2.53	96.1
Lower Global Coal Demand	1.95	0.92	2.61	104.7
Slow and Disorderly Energy Transition	1.94	0.65	2.66	101.3

Further information and contacts

For further Information or clarification on issues raised in this paper, please contact:
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