VICTORIA'S CLIMATE CHANGE STRATEGY

ECONOMIC ANALYSIS

VICTORIA
State Government

Acknowledgement

We acknowledge and respect Victorian Traditional Owners as the original custodians of Victoria's land and waters, their unique ability to care for Country and deep spiritual connection to it. We honour Elders past and present whose knowledge and wisdom has ensured the continuation of culture and traditional practices.

We are committed to genuinely partner, and meaningfully engage, with Victoria's Traditional Owners and Aboriginal communities to support the protection of Country, the maintenance of spiritual and cultural practices and their broader aspirations in the 21st century and beyond.

Acknowledgements

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ISBN 978-1-76105-547-8 (pdf/online/MS word)

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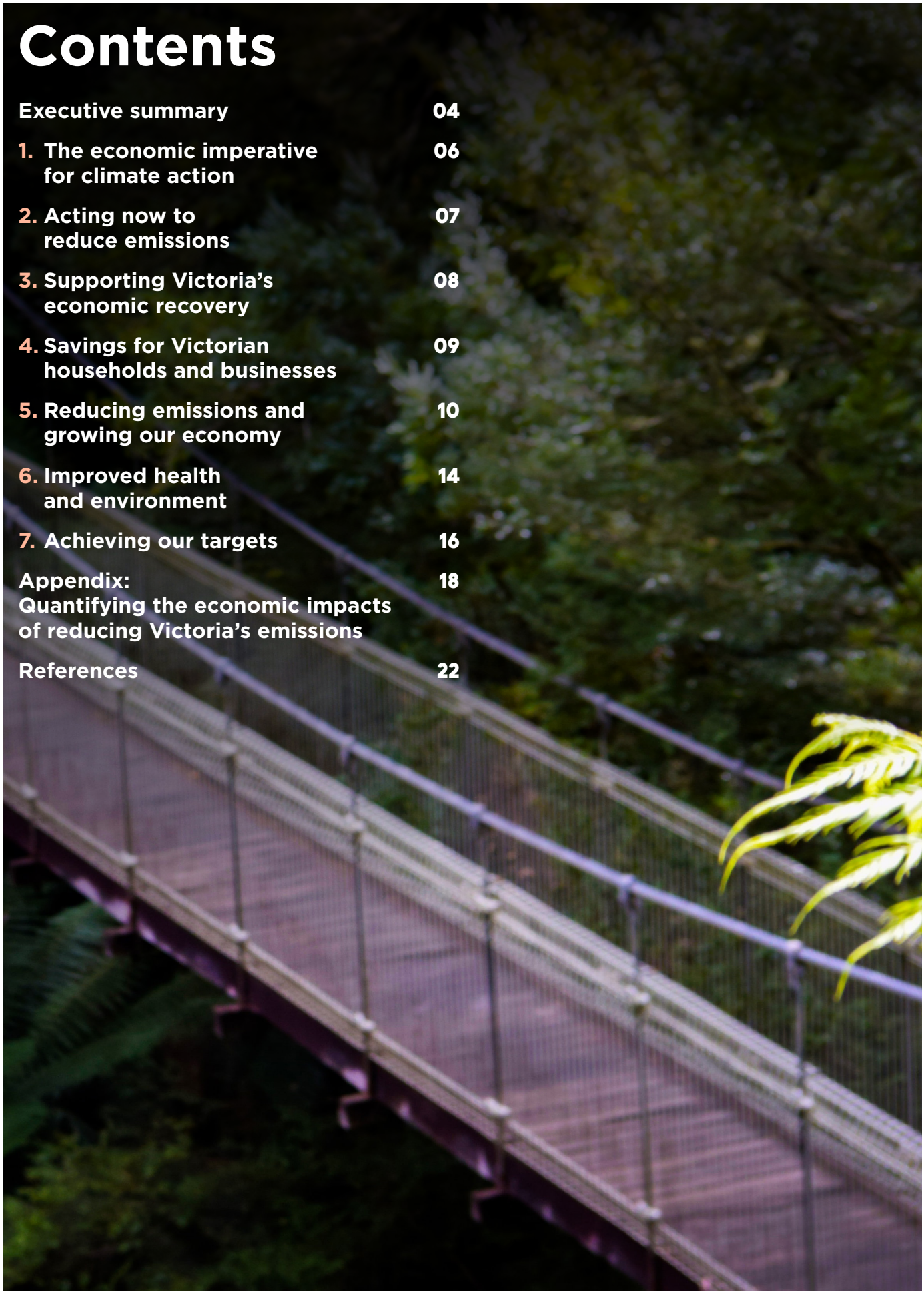


Executive summary

In its new Climate Change Strategy, the Victorian Government has set out a comprehensive plan to fulfill the next stages of its legislated pledge to achieve net-zero greenhouse gas emissions across the state by 2050. A key part of the plan is the setting of ambitious, yet achievable interim emissions reduction targets for this decade. The new targets are:

/ 28–33 per cent below 2005 levels for 2025

/ 45–50 per cent below 2005 levels for 2030.

This report presents the economic case for strong climate action in Victoria, explores the benefits and costs of Victoria's 2025 and 2030 emissions reduction targets, and discusses how Victoria will meet those targets.

As set out in Victoria's *Climate Change Act 2017*, many factors influence the setting of emissions reduction targets, including the:

/ Latest climate science

/ Availability of opportunities for Victoria to act

/ Need to reach our legislated target of net-zero emissions by 2050

/ Advice of the Independent Expert Panel on Interim Emissions Reduction Targets[1]

/ Economic and social impacts of acting at a given time and in a particular manner.

This document sets out evidence on the economic impacts of these targets and the supporting policies. It brings together several pieces of analysis that cover different aspects of the benefits and costs.

The economic case for strong climate action

Climate change poses a significant threat to our environment and to our social and economic future. By contrast, the costs of reducing greenhouse gas emissions to help avoid the worst impacts of climate change are relatively low.

Victoria is already experiencing the effects of climate change and could face far more damaging impacts in coming decades if the world does not take further action to tackle climate change. A recent study conservatively estimated the state would incur damage costs of about $1 trillion by 2100 if no further global action was taken.[2,3] Other studies confirm that the economic benefits of limiting further climate change significantly outweigh the costs[4,5] (Section 1). Delaying action would also be more expensive than acting now – and would put a significant burden on future generations[6] (Section 2).

Through its climate change legislation, the Victorian Government is committed to playing its part in the global effort to combat climate change and reaching net-zero emissions by 2050. And the most cost-effective way to do that is by acting now.

The costs and benefits of Victoria's 2025 and 2030 emissions reduction targets

The Victorian Government has set emissions reduction targets of 28–33 per cent below 2005 levels for 2025 and 45–50 per cent below 2005 levels for 2030. These targets are both ambitious and achievable, and provide a clear roadmap for governments, businesses and households to make informed decisions and invest for the future.

In the short term, Victoria's investment in emissions reductions will boost the economy and generate thousands of new jobs, including in regional Victoria, as we recover from the coronavirus (COVID-19) pandemic. Research has found that 'green' stimulus initiatives – such as in renewable energy, energy efficiency and land regeneration – are quick to implement and deliver more local jobs, higher short-term economic returns and greater long-term cost savings than traditional stimulus initiatives[7] (Section 3).

For many Victorians, the most noticeable economic impact as emissions are reduced is likely to be lower energy bills. Actions to reduce emissions in the Climate Change Strategy will reduce energy costs for Victorian households and businesses by an estimated $2.6 billion over the next four years, and by $13 billion by 2030. For example, the expanded Solar Homes program will provide rebates to 778,500 households and 15,000 businesses to install small-scale renewable energy systems, saving them hundreds of dollars on their energy bills each year (Section 4).

Economy-wide modelling shows that the Victorian economy, and with it wages and jobs, will continue to grow strongly between now and 2030 while we cut emissions. The modelling projects that most of Victoria's industries (including heavy industry and manufacturing) will continue to grow, while some sectors – including renewables – will grow more strongly than they otherwise would have. In line with global trends, sectors associated with fossil fuels are projected to decline, reflecting broader trends such as the increasing competitiveness of renewable energy and the ageing of Victoria's coal-fired electricity generators (Section 5).

The modelling shows that the overall economic costs of meeting Victoria's targets will be low. Based on historical experience, it is likely that the costs of meeting the targets could be even lower than projected. Most past modelling exercises of this type have overestimated costs because, for example, technological progress (such as in solar panel and electric vehicle technology) has outstripped expectations (Section 5).

Action on climate change provides benefits beyond reducing greenhouse gas emissions. For example, reducing the burning of fossil fuels by switching to renewable energy and electric vehicles can reduce local air pollution, thereby improving human health. In Victoria, it is estimated that reduced air pollution resulting from curbing fossil fuel use could result in health benefits of around $2 billion to 2030, and around $23 billion to 2050. Tree planting to remove carbon dioxide from the atmosphere can also help restore natural landscapes. These non-financial benefits are not captured in the economy-wide modelling referenced above, providing a further reason why actual net costs could be lower than projected (Section 6).

Achieving targets for 2025 and 2030

Actions detailed in our Emissions Reduction Pledges for 2021–2025 are projected to enable our 2025 target to be met – and will lay the foundations for meeting our 2030 target. Analysis shows we have a range of further emissions reduction options available to meet the 2030 target.

The Victorian Government will develop new and strengthened policies to help us meet the 2030 target – both as part of the next scheduled round of Emissions Reduction Pledges (for 2026–2030), and prior to this as opportunities arise. In doing so, we will work with businesses and communities to respond to changing circumstances, technology developments, falling costs and other emerging solutions (Section 7).

1. The economic imperative for climate action

There are significant global and local economic consequences to not acting on climate change. Victoria has made a legislative commitment to play its part in avoiding the worst of those consequences.

Unmitigated climate change would have devastating impacts on human health, agriculture, property and the environment.[8]

A recent University of Melbourne study estimated that, with no further global action, the cost of damage caused by climate change in Victoria through to 2050 would be over $150 billion, escalating to about $1 trillion by 2100. These estimates are likely to understate the full financial impacts, as they do not include most of the costs of floods, bushfires, pollution and biodiversity loss.[9] While some of these costs are effectively locked in due to inertia in climate systems, most of the longer-term costs can be avoided through effective global climate action.

A wide body of international research supports the finding that the benefits of tackling climate change – and therefore reducing these impacts – outweigh the costs.[10] The Stern Review found that, for the world, the costs of doing nothing were between 5 and 20 times the costs of acting to avoid the worst impacts of climate change. Most published climate change economists agree that continued climate change will harm economic growth, and that strong climate action is economically justified.[11]

Based on economic modelling, the Garnaut Review found that it was in Australia's national interest to contribute its fair share towards a strong global effort to mitigate climate change. No single region or country can ensure success; each needs to play its part, and those that lead can encourage others to do more.

Climate change is already costing Victoria

Victoria is already experiencing the costs of climate-related impacts such heatwaves, droughts, floods and an increase in the length and severity of dangerous fire conditions. Examples of climate-related events with high economic impacts include:

- The Black Saturday bushfires in 2009, estimated to have cost the state economy $7 billion.[12]
- The 2019–20 bushfires, which a Royal Commission estimated to have resulted in national costs of $10 billion.[13] However, new research suggests that figure may have understated the full costs, with smoke-related health costs estimated at $486 million for Victoria alone.[14]
- Heatwaves, estimated to cost the Victorian economy an average of $87 million per year.[15]
- The 2010–11 Victorian floods, estimated to have cost the Victorian economy $1.3 billion.[16]

Broadacre farm profits in Victoria over the last 20 years are also estimated to be 37 per cent below what they would have been if earlier climate conditions had persisted.[17]

While identifying causes for these types of events is complex, a global study has shown that more than two-thirds of extreme weather events were made more likely or more severe by climate change.[18] Climate projections for Victoria suggest the risk of climate-related impacts and the costs associated with them are expected to increase in the future.[19]

2. Acting now to reduce emissions

Victoria has choices about how to achieve net-zero emissions by 2050. The most cost-effective option is to act now. This will allow us to benefit from the immediate economic opportunities of the transition to net-zero – and to avoid placing a heavy burden on future generations through our delayed action.

Victoria has legislated a target of net-zero emissions by 2050, consistent with the commitment of the global community through the Paris Agreement.[20] To achieve our net-zero target, we have a choice between taking strong action to reduce emissions now or leaving the heavy lifting until later decades.

Expert analysis commissioned by the Victorian Government demonstrates the benefits of early action. The analysis found that pathways to net-zero that achieved greater emissions reductions by 2030 had lower overall economic costs than pathways that delayed strong action until after 2030 (all pathways have the same limit on cumulative emissions consistent with keeping global warming to 2 degrees Celsius).[21] For example, a pathway that led to Victoria reducing emissions by 45 per cent by 2030 (relative to 2005 levels) would cost the state economy between 15 and 25 per cent less than a pathway that reduced emissions by just 28 per cent by 2030.[22] This is because early action makes greater use of relatively low cost opportunities that either exist now or are rapidly emerging – and early experience with reducing emissions can drive down later costs through 'learning by doing'.

The findings were tested under various assumptions, using a range of discount rates and cost curves. In each case, the main finding – that is it not cost effective to delay action – was found to be robust.

Significant economic opportunities are available to help advance the transition to a net-zero emissions economy – and acting now allows us to make the most of them. These opportunities include:

- Reducing energy bills through improved energy efficiency
- Establishing 'industries of the future' such as hydrogen, large-scale batteries and offshore wind generation
- Tapping into growing consumer and business preferences for low emissions products such as clean energy and locally-grown food
- Helping retain access to international markets as countries impose border taxes related to the carbon intensity of imported products.

Acting now also helps avoid the costs of locking in high-emissions investments – for example in non-renewable energy infrastructure – and then having to deal with the resulting emissions, rather than investing in low emissions alternatives in the first place.

3. Supporting Victoria's economic recovery

Over the next few years, Victoria's investments in emissions reduction will boost the economy and generate thousands of new jobs as we recover from the coronavirus (COVID-19) pandemic.

Governments around the world are looking to stimulate their economies to aid the recovery from the coronavirus (COVID-19) pandemic. Leading researchers have found that investing in emissions reductions is a particularly good way to do this, as many 'green' investments have greater stimulatory effects per dollar spent than traditional stimulus initiatives (such as investments in fossil fuel based infrastructure).[23]

This happens because investment in areas like renewable energy, energy efficiency, land regeneration and clean research and development is often quick to implement and can deliver more local jobs, higher short-term economic returns, and greater long-term cost savings. One economic modelling exercise found that investments in renewable energy infrastructure and energy efficiency created more jobs then investments in fossil fuels.[24] The green stimulus approach has been adopted by jurisdictions around the world, from Germany to South Korea, as they respond to the current economic crisis.[25]

Victoria's Climate Change Strategy outlines emissions-reducing government actions that are already stimulating the state economy and creating jobs as we recover from the pandemic. These actions are boosting investment in our economy – both directly, through government spending, and indirectly, by leveraging private sector financing. For example, the second Victorian Renewable Energy Target auction is expected to attract $1 billion in private capital expenditure on new renewable energy generation capacity in Victoria by 2025. Government investments include $797 million allocated to helping Victorians to cover the cost of their power bills and make their homes more energy efficient, and $92.3 million to nature restoration for carbon storage and carbon farming programs.

These actions will create thousands of jobs. For example:

- Achieving Victoria's 2030 renewable energy target is expected to create around 24,000 two-year jobs in the period leading to 2030
- Household energy efficiency measures, including the expansion of the Solar Homes and Victorian Energy Upgrades programs, will support around 4,000 jobs, of which 1,500 will be new
- The Recycling Victoria strategy to cut waste and support a circular economy will create around 4,000 jobs.

4. Savings for Victorian households and businesses

Cutting emissions will deliver economic savings for many.

For many Victorians, the most noticeable economic impact as emissions are reduced is likely to be lower energy bills.

Emissions-reduction actions detailed in the Climate Change Strategy will cut energy costs for Victorian households and businesses by an estimated $2.6 billion over the next four years, and by $13 billion by 2030.

These savings on energy bills will be generated through investment in renewable energy and energy efficiency initiatives, including:

- Meeting Victoria's 2030 renewable energy target, which is expected to generate average annual electricity bill savings of around $32 for households, $3,100 for medium-size businesses and $150,000 for large companies
- '7-Star' building standards, planned to take effect from September 2022, which will save hundreds of dollars per year on energy bills for owners of those new homes
- Rebates to 250,000 low-income and vulnerable households to install high efficiency air conditioners in place of old heaters – expected to save households between $300 and $900 per year
- The expanded Solar Homes program, which will provide rebates to 778,500 households and 15,000 businesses to install small-scale renewable energy, saving them hundreds of dollars on their energy bills each year
- The Victorian Energy Upgrades program, which will reduce Victoria's energy demand by 7 per cent by 2025, delivering energy bill savings for all Victorians
- Energy efficiency upgrades to 35,000 social housing properties to help reduce energy use and improve thermal comfort.

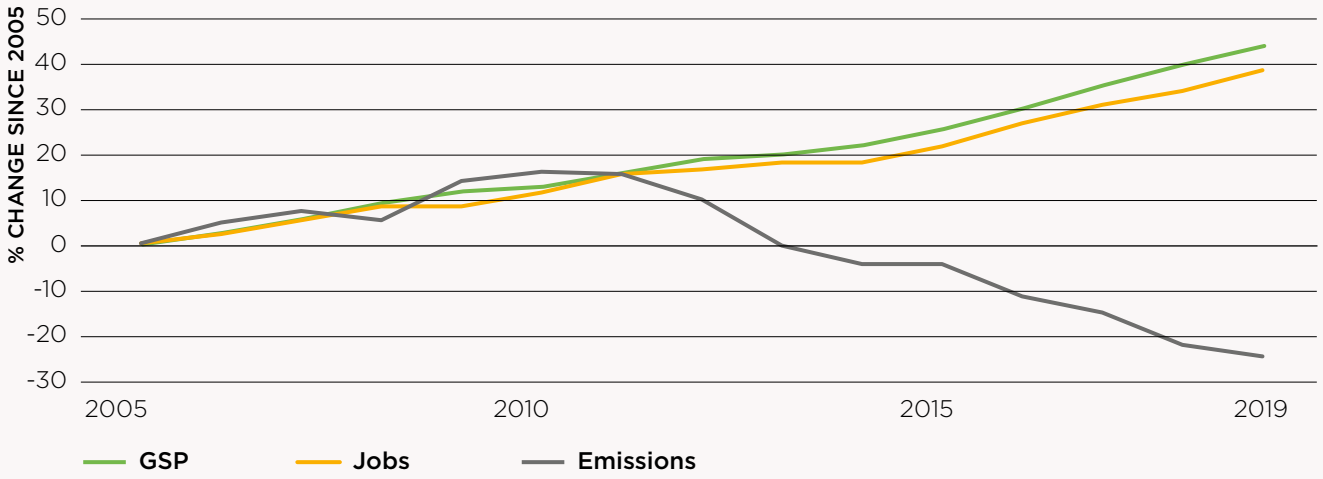
Other Victorian Government initiatives are also helping Victorians save money on energy. One of these is the Victorian Default Offer (VDO), which provides a simple, trusted and fair price for electricity that safeguards the interests of ordinary households and businesses that are not engaged in energy markets. The VDO has continued to fall since it was introduced in July 2019, in part due a reduction in wholesale electricity prices during 2020. Depending on their network area, residential customers on the VDO are saving between $139 and $189 in 2021, compared to 2020. In addition, under the $250 Power Saving Bonus Program, a one-off $250 payment is available to eligible Pensioner Concession Card holders and some Health Care Card holders (around 900,000 Victorian households in total).

5. Reducing emissions and growing our economy

We can reduce emissions while maintaining strong growth in jobs and the economy. Victoria is one of many economies around the world to have proven this in recent decades.

Since 2010, Victoria's emissions have been steadily falling while our economy has continued to grow. According to the latest available data, emissions fell by 24.8 per cent between 2005 and 2019 – exceeding our target of 15 to 20 per cent by 2020. Over the same period the economy grew by 43.4 per cent and jobs grew by 38.0 per cent (Figure 1). This mirrors the experience of other jurisdictions around the world – from California to the United Kingdom – that have set emissions reduction targets.[26]

Figure 1. Changes to Victorian gross state product, jobs and greenhouse gas emissions 2005–2019



Source: Australian Greenhouse Emissions Information System, Australian Bureau of Statistics (ABS) Gross State Product Table 1, ABS Labour Force Victoria Table 5.

Victoria's emissions

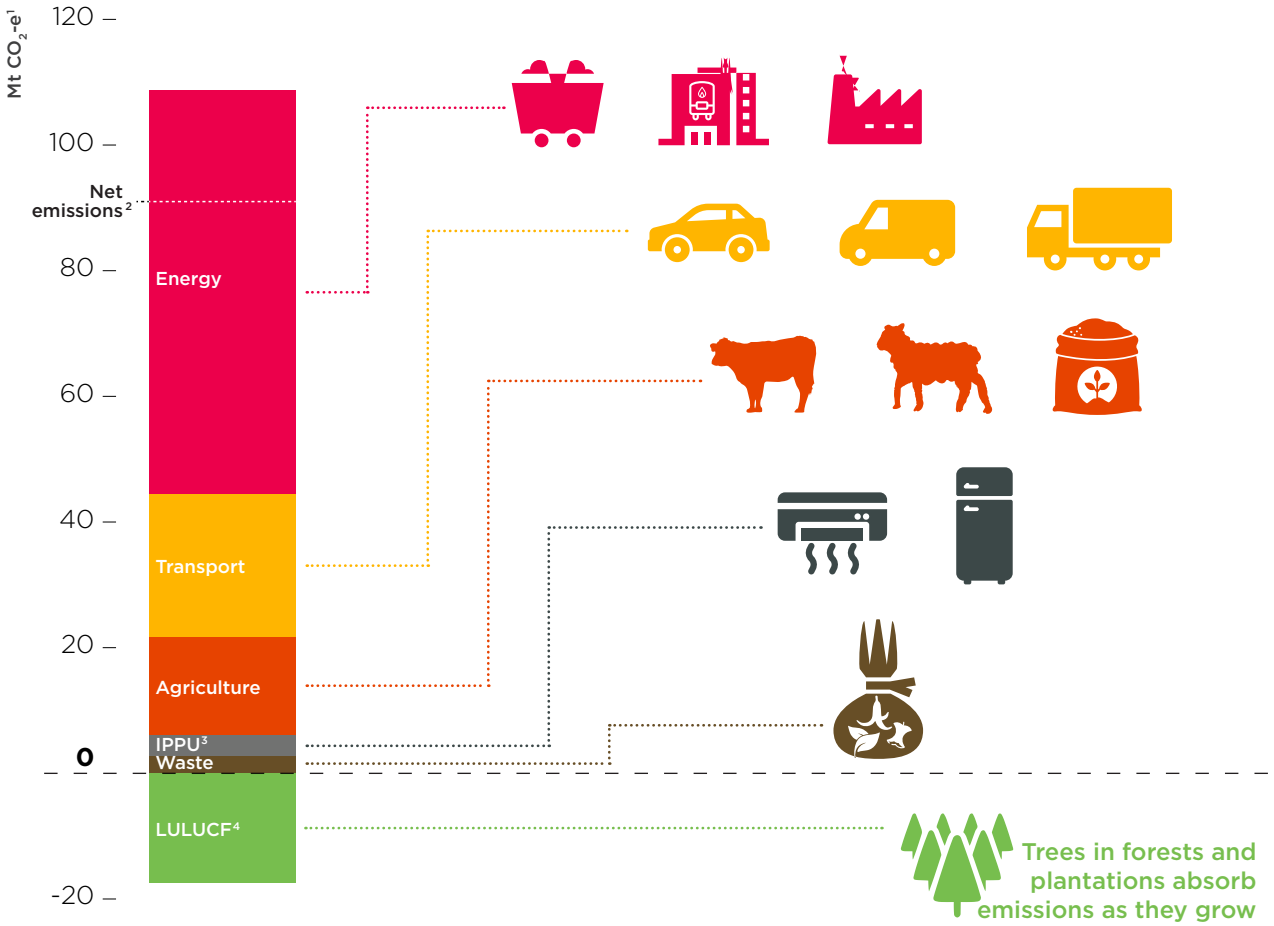
In 2019, the largest source of Victoria's emissions was the energy sector. Its emissions come primarily from fossil fuels burned for electricity generation (mainly coal) and combusted directly by industries, businesses and households (mainly gas).

The next largest emissions sources are the transport sector – mainly from fuel consumed by cars and trucks – and the agriculture sector from livestock and soils.

The remainder of Victoria's emissions come from industrial process and product use (IPPU) – which includes leaks of refrigerant gases – and waste, which includes methane gas from landfills.

The land use, land use change and forestry (LULUCF) sector in Victoria is an emissions sink, which means it absorbs more emissions than it releases.

Where our emissions come from



Victoria's greenhouse gas emissions by emissions sector in 2019

1 Million tonnes of carbon dioxide equivalent emissions

2 Victoria's net emissions are total emissions less the emissions absorbed in the LULUCF sector

3 Industrial processes and product use

4 Land use, land use change and forestry

Economic modelling is a useful tool to help us understand the impacts of future emissions reductions – but it doesn't tell the whole story.

The Victorian Government commissioned computable general equilibrium (CGE) economic modelling to estimate the economic impacts of reducing emissions to meet Victoria's targets for 2025 and 2030. As with all exercises of this nature, the CGE economic modelling does not capture all relevant factors, and therefore should be considered alongside other analyses of the economics benefits and costs. For instance, it does not consider the significant economic costs of not acting (Section 1), and nor does it quantify the significant non-climate related benefits of climate action such as cleaner air and healthier communities (Section 6).

The full economic benefits and costs of reducing Victoria's emissions will depend on factors such as the:

- Rate of future technology development
- Rate at which Victoria develops low carbon skills, capabilities and supply chains
- Choice of policy mechanisms
- Type and speed of emissions reductions actions undertaken.

The Victorian Government will continue to develop emissions reducing actions over time (Section 7), taking these factors into account.

The CGE economic modelling incorporates assumptions based on current knowledge. Where uncertainties exist, history suggests that the modelling choices overall are likely to be conservative. Hence it is likely that the economic costs of emissions reduction have been over-estimated. The high ongoing pace of technology change is one key factor that may see emissions reduced at lower cost than projected (see Appendix).

To 2030, most of Victoria's emissions – and emissions reductions – will occur in the energy system, where cost effective solutions are already available. The lowest-cost option for new electricity generation capacity is zero emissions renewables – and costs are continuing to fall rapidly. The recently-announced plan by Energy Australia to bring forward the closure of Yallourn Power Station also demonstrates that substantial emissions reduction may be delivered through changes in market conditions – not just government intervention.

As is typical for modelling of this nature, the CGE economic modelling considers the effects of policy on an economy in its 'normal' (equilibrium) state. This means it does not capture the stimulatory benefits of emissions reduction investment during a recession. Hence, while CGE modelling provides useful estimates over the longer term, other analysis (Section 3) is more applicable in the short term as the Victorian economy recovers from the coronavirus pandemic. Further discussion of uncertainties in modelling is provided in the Appendix.

Modelling shows that the economy, wages and employment will keep growing strongly as we cut emissions further.

The CGE economic modelling simulated four different emissions reduction scenarios for Victoria, with different hypothetical emissions reduction targets for 2025 and 2030 on the way to net-zero emissions by 2050 (Table 1).

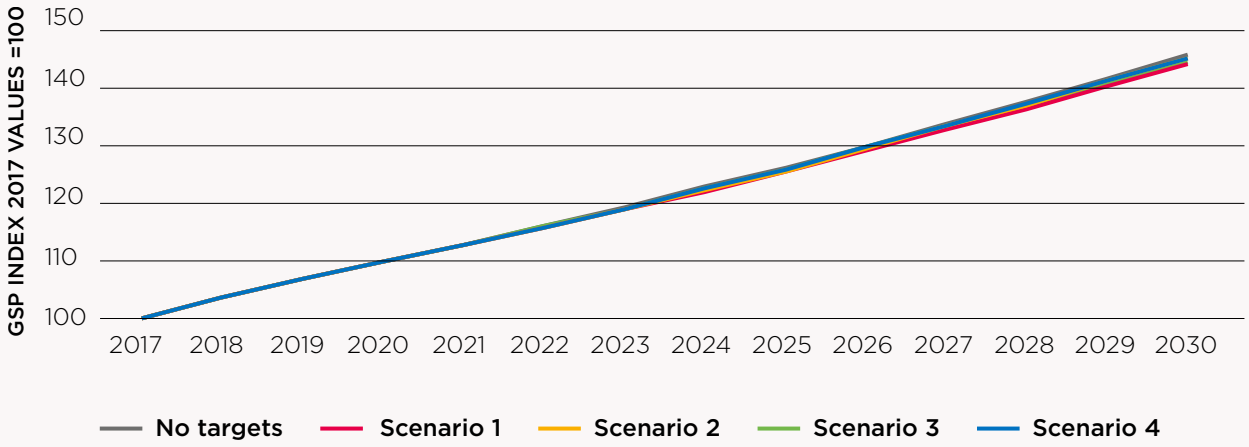
Table 1. Economic modelling of emissions reduction scenarios in Victoria

Scenario	2025 (below 2005 levels)	2030 (below 2005 levels)
Scenario 1	39%	60%
Scenario 2	32%	45%
Scenario 3	25%	45%
Scenario 4	25%	40%

Scenario 1 and Scenario 2 modelled the upper and lower ends, respectively, of the target ranges recommended by the Independent Expert Panel on Interim Emissions Reduction Targets. Scenario 3 is the most closely aligned with both the Victorian Government's chosen targets and projections of how emissions reductions are likely to be achieved. While the modelled reductions for Scenario 2 falls within the Government's 2025 target range, the underlying assumptions on how emissions reductions are distributed across different sectors is less aligned with the Climate Change Strategy and current market conditions than the assumptions in Scenario 3.

The modelling projects that the state economy and jobs will continue to grow under all scenarios. Under Scenario 3, Victoria's rate of economic growth is projected to be on average 0.06 percentage points lower per year than it would be under a continuation of previous policies (Figure 2). This means it would take only 4 months longer for the economy to get to the size it would otherwise be in 2030. A similar scale of impacts is seen in other key economic indicators such as employment and consumption (see Appendix).

Figure 2. Victorian projected gross state product with and without emissions reduction targets



Source: The Centre for International Economics, for the Department of Land, Environment, Water and Planning

The results from Scenario 1 indicate that reaching the upper bounds of the 2025 and 2030 targets is unlikely to lead to substantially greater economic costs than results projected under Scenario 3.

The finding that emissions reductions can be achieved at low overall cost to the economy is consistent with previous Australian and international analyses.[27]

While the effects of emissions reduction efforts are projected to be small overall, the impacts will vary across industries. Some industries will grow more strongly, while a few will decline. These changes will take place against a backdrop of changes that are occurring for reasons other than action on climate change. The structure of the Victorian economy will continue to evolve and change, as it has in the past. And the changes resulting from emissions reduction policies will be small relative to changes from other factors, such as shifts in export prices, technological progress, and the ageing of the population.

The modelling projects that under Scenario 3, 55 out of 58 industry sectors will grow in real terms between 2020 and 2030. Some industries, including renewable energy, will grow more strongly than they would have. In line with global trends, the sectors that decline in real terms will be those associated with fossil fuels. These declines are influenced by the increasing competitiveness of renewable energy and the ageing of Victoria's coal-fired generators. The Victorian Government is committed to supporting workers and communities linked to industries in transition. All other industry sectors will continue to grow, including heavy industries and all categories of manufacturing.

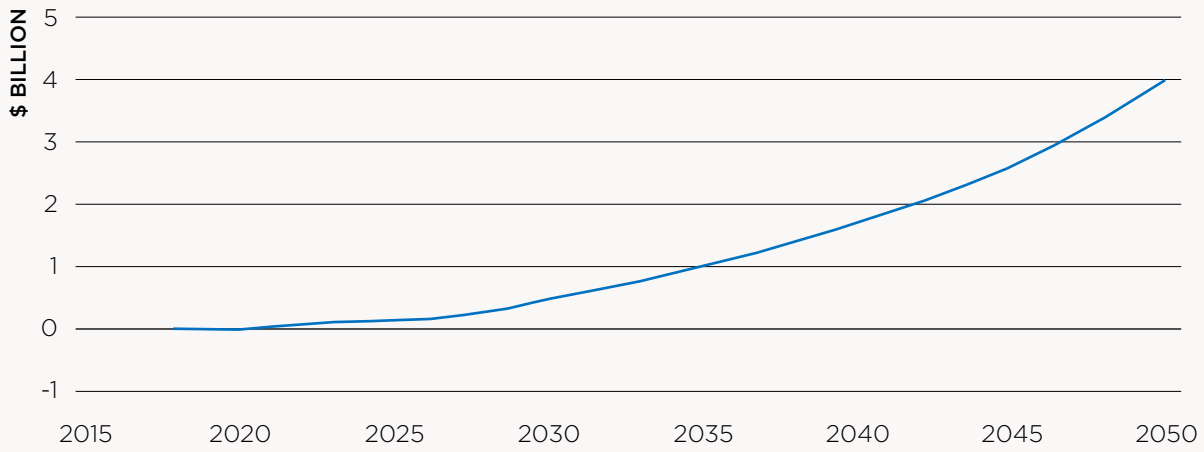
6. Improved health and environment

Action on climate change provides significant health and environmental benefits to all Victorians.

Action on climate change provides benefits beyond reducing greenhouse gas emissions – such as through cleaner air, buildings that perform better in hot and cold weather, and protection and restoration of natural landscapes.

Reduced burning of fossil fuels resulting from large-scale uptake of renewable energy and electric vehicles can deliver significant human health benefits through reductions in local air pollution. Modelling of Victoria's 2030 emissions reduction targets, discussed above, found reduced air pollution through curbing fossil fuel use could result in health benefits of around $2 billion up to 2030, and around $23 billion to 2050.[28] This is because local air pollutants from fossil fuel combustion – particularly from coal-fired electricity generation and internal combustion engines in motor vehicles – produce local air pollutants associated with sometimes fatal cardiovascular and respiratory diseases.[29] The transport-related benefits are projected to increase substantially over time (Figure 3).

Figure 3. Annual health benefits from transport emissions reduction in Victoria



Source: The Centre for International Economics, for the Department of Land, Environment, Water and Planning

Actions detailed in the Climate Change Strategy will also realise other health and environmental benefits, such as:

- Improved comfort and liveability of homes, and reductions in the harmful health effects of extreme summer and winter conditions through the investment of:
  - $5.3 billion to construct more than 12,000 low-cost homes, all of which will meet 7-Star energy efficiency standards
  - $335 million in rebates to 250,000 low-income and vulnerable households to install high-efficiency reverse-cycle air conditioners
  - $112 million to upgrade thermal performance and appliances in 35,000 existing social housing properties.
- Improvements in land productivity and protection of livestock and crops through the $15.3 million Victorian Carbon Farming Program, which will encourage landholders to plant trees for agroforestry and shelterbelts (lines of trees that protect crops and animals against extreme weather).
- Restoration and protection of natural landscapes and vegetation through the $92.3 million Nature Restoration for Carbon Storage – BushBank fund and Carbon Farming programs. The fund will provide economic support for Traditional Owners, landowners and rural communities, and create jobs in regional Victoria, while the Carbon Farming program will provide incentives for landholders to plant trees.
- Improved cycling and walking infrastructure. The Victorian Government is building or planning over 250 kilometres of cycling and walking paths through its major transport infrastructure program. In addition, 100 kilometres of new and improved cycling routes are being trialled across key inner Melbourne suburbs to make it easier and safer for people to cycle to and from the CBD. These initiatives support the Government's aim for 25 per cent of trips to be made by cycling or walking by 2025.

7. Achieving our targets

As set out in the Climate Change Strategy, Victoria's 2025 emissions reduction target will be met through delivery of emissions reduction pledges for 2021–2025. These pledges establish actions for each of seven defined emissions sectors – energy, waste, agriculture, transport, land use, land use change and forestry (LULUCF), industrial processes and product use, and whole-of-government. These current actions also lay the foundations for meeting the 2030 target.

The Government will take further action to meet our 2030 target by:

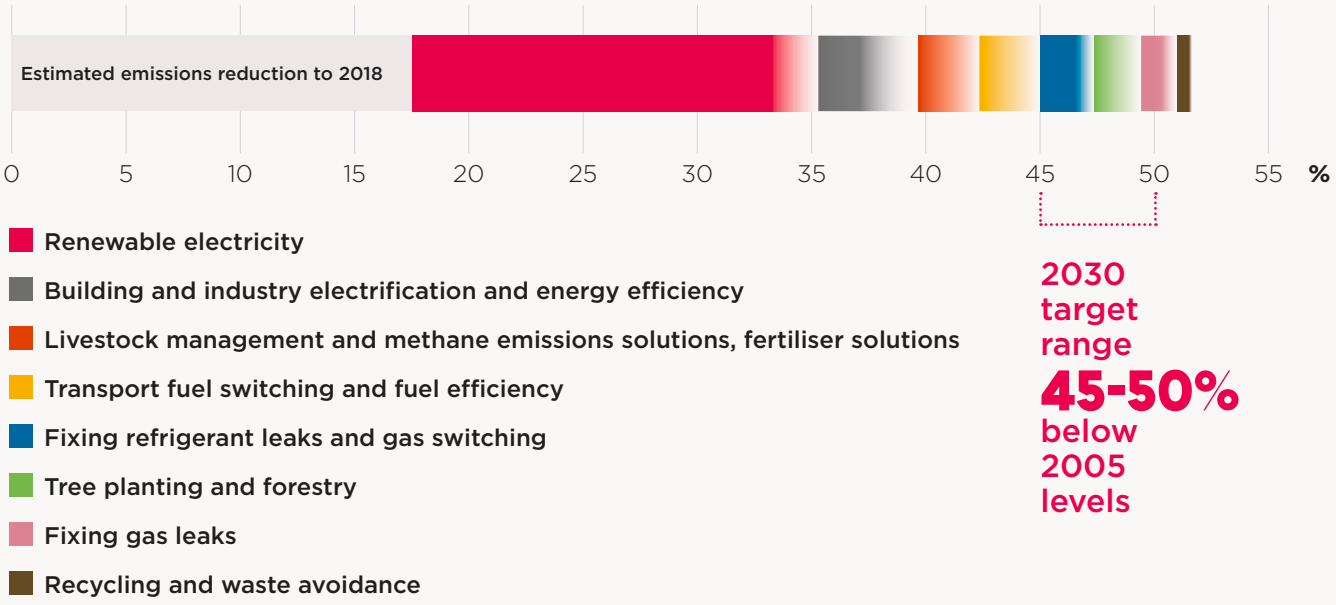
- Continuing to develop new emission reduction policies and strengthening existing policies in the coming years, including through processes established in the 2021–2025 pledges. These processes include the development of a Gas Substitution Roadmap and an Expert Advisory Panel to provide advice on zero emission vehicle policy.
- Shaping ambitious new emissions reduction pledges for 2026–2030, as part of our commitments under the *Climate Change Act 2017*.

Victoria has a range of potential options available to help reach the 2030 target, with different combinations of action across sectors capable of delivering the total required emission reductions. The main options for emission reductions in Victoria are:

- Increased use of renewable electricity and flexible electricity demand management
- Building and industry electrification and energy efficiency; and potentially the use of hydrogen and, or biogas
- Transport fuel switching (from petrol and diesel to electric and/or hydrogen), and improvements in fuel efficiency
- Tree planting and forestry, and potentially soil and blue carbon sequestration
- Fixing leaks and sources of 'fugitive' emissions from natural gas production and pipelines
- Fixing leaks from air conditioners, refrigerators and freezers and switching to more climate-friendly refrigerant gases
- Livestock and manure management, potential solutions for methane emissions from livestock (for example, through breeding, feed additives and vaccination) and fertiliser solutions (such as precision application and reformulation)
- Recycling and waste avoidance.

Figure 4 shows analysis of the potential for emissions reduction from each of these activities by 2030, based on current knowledge. This reduction is additional to emissions reduction already achieved by 2018 (shown in the white bar on the left side of the graphic).[30] While the emission reduction estimates for each activity are approximate, and some will be easier to achieve than others, in combination they exceed 50 per cent. This provides confidence that Victoria's 2030 target is achievable and that there are a range of options and pathways we can choose from.

Figure 4. Victorian emissions reduction potential to 2030, including level of certainty in delivery



Note: The shading of each block of emissions reduction represents the degree of certainty associated with delivery of those reductions. Shading is illustrative and not a forecast. Analysis based on 2018 data.

Source: DELWP analysis based on ClimateWorks (2020) Decarbonisation Futures

The potential for Victorian emissions reduction has varying degrees of certainty – represented above with solid shading for greater certainty, and transparent sections being more dependent on developments over the coming decade – as:

- Some sectors can draw on solutions that are already mature, cost effective, and ready to be deployed at scale, while solutions in other sectors are still emerging and have higher levels of uncertainty as to their future scalability and cost effectiveness.
- Substantial technological progress is likely over the coming decade, alongside changes in individual preferences, market conditions and in international and national climate policies. Changes in these factors could significantly alter Victoria's options for emissions reduction and the relative feasibility of those options.
- While some reduction opportunities are already taken up through emission reductions pledges 2021–2025, others require further policy action. This will be taken by the Victorian Government, as set out above. Therefore, which of the remaining reduction options will be pursued depends on those future policy processes.

The analysis in Figure 4 therefore provides a snapshot, based on current understanding and policies, and will change over time as these factors develop. The Victorian Government will continue to work with communities and businesses to develop further actions to reduce Victoria's emissions, taking account of evolving circumstances.

Appendix: Quantifying the economic impacts of reducing Victoria's emissions

The Department of Land, Environment, Water and Planning commissioned the Centre for International Economics (CIE) to conduct modelling to quantify the economic impacts of reducing Victoria's emissions.

The CIE conducted the modelling using 'CIE – Regions', its in-house computable general equilibrium (CGE), or economy-wide, model. Economy-wide models have been commonly used to estimate the economic impacts of emissions reduction policy in Australia and globally for the past three decades. The CIE modelling commissioned for this analysis, while focused on Victoria, also took account of potential actions in other Australian jurisdictions in line with their targets for emissions reductions.

This modelling approach is suitable to provide an overall estimate of the expected cost to the Victorian economy but, as discussed in the body of this report, has some limitations. The CGE model captures up-to-date information about the whole of the Victorian economy, as well as interactions between different sectors of the economy, to inform analysis of the opportunities and costs of reducing Victoria's emissions – while accounting for interlinkages between industries and sectors. Specific sectoral and regional impacts estimated in this way are indicative – in practice impacts may vary depending on the specifics of the policies implemented.

A range of existing studies also informed the detailed inputs into the modelling – including economic projections and sectoral studies undertaken for the Victorian Government and other studies by respected sources such as the Australian Energy Market Operator.

In this type of modelling, the economic impacts of reducing emissions are estimated by comparing the results for a reference case (or business-as-usual scenario) with scenarios with additional emissions reductions (mitigation scenarios). The reference case was based on Victorian Government policies that existed prior to the 2020–21 State Budget, and prevailing market circumstances and trends (in relation to factors such as expected technological developments, and population and economic growth).

One of the four mitigation scenarios – Scenario 3 – is broadly consistent with both the targets subsequently adopted by the Government (Victoria's 2025 and 2030 targets scenario) and how those emissions reductions are likely to be achieved. This scenario has 2025 emissions at 25 per cent below 2005 levels, and 2030 emissions at 45 per cent below 2005 levels – and has underlying assumptions of how abatement is distributed across different sectors that are well aligned with the Climate Change Strategy and current market conditions. For example, it includes the impacts of Yallourn Power Station closing in 2028, as recently announced by EnergyAustralia.

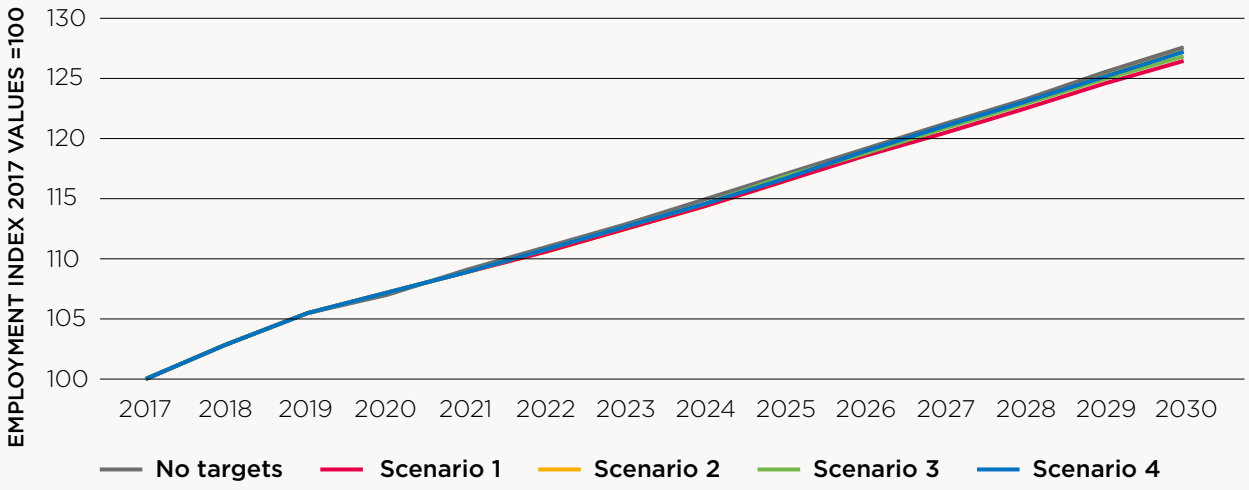
While Scenario 2, with 32 per cent abatement in 2025, may also appear closely aligned to the Government's targets, the underlying assumptions are less well aligned.

In line with standard modelling practice, policies in the mitigation scenarios that are not in the reference case and require government funding are treated as requiring increased government revenue (taxation). This assumption is required for the model to be internally consistent and is neither a prediction nor a recommendation.

Given the nature of the analysis, the relativities between the reference case and mitigation scenarios should be understood as more robust than the projected absolute levels within a scenario. Absolute levels of economic activity and emissions will be driven by supply side factors such as productivity improvement and employment growth, and demand side factors such as population growth and international demand. To the extent that the values observed in the future deviate from the CIE's projections, the deviation will shift all scenarios and the reference case roughly equally without substantially changing the comparative analysis of one scenario versus the other (or versus the reference case).

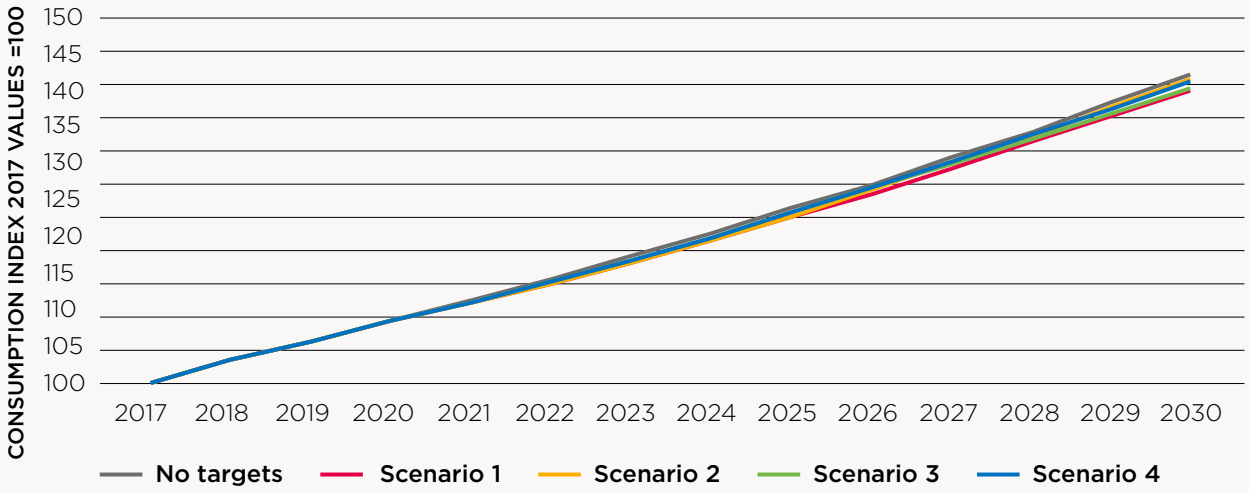
Modelling results for gross state product (GSP) are provided in Section 5 above. Results for employment, consumption and investment are shown below in Figures 5 to 7.

Figure 5. Victorian projected employment with and without emissions reduction targets



Source: The Centre for International Economics, for the Department of Land, Environment, Water and Planning

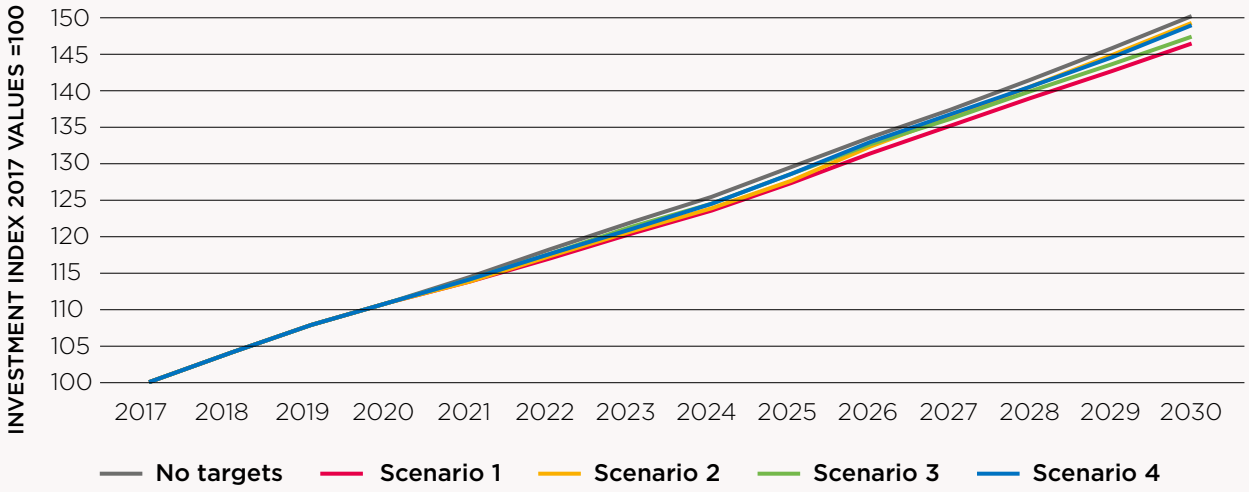
Figure 6. Victorian projected consumption with and without emissions reduction targets^



^ *Consumption is a measure of total private and public spending adjusted by inflation*

Source: The Centre for International Economics, for the Department of Land, Environment, Water and Planning

Figure 7. Victorian projected investment with and without emissions reduction targets



Source: The Centre for International Economics, for the Department of Land, Environment, Water and Planning

Sensitivity analysis for a range of parameters generally showed only modest changes to GSP and other variables. Simulations where abatement costs were increased showed a correspondingly greater reduction in GSP relative to the reference case. For example, with a 20 per cent increase in abatement costs, the reduction in GSP relative to the reference case for mitigation scenario one (reaching 60 per cent below 2005 levels by 2030) was 1 per cent in 2030, whereas the reduction with standard abatement costs was 0.7 per cent.

Scenarios with a higher proportion of abatement occurring in the electricity sector tended to have lower costs per unit of abatement. The costs to Victoria were higher if it was assumed other Australian states took no action to reduce emissions (rather than meeting their stated 2030 emission reduction targets). Under mitigation Scenario 1, this impact was equivalent to 0.20 percentage points in 2030.

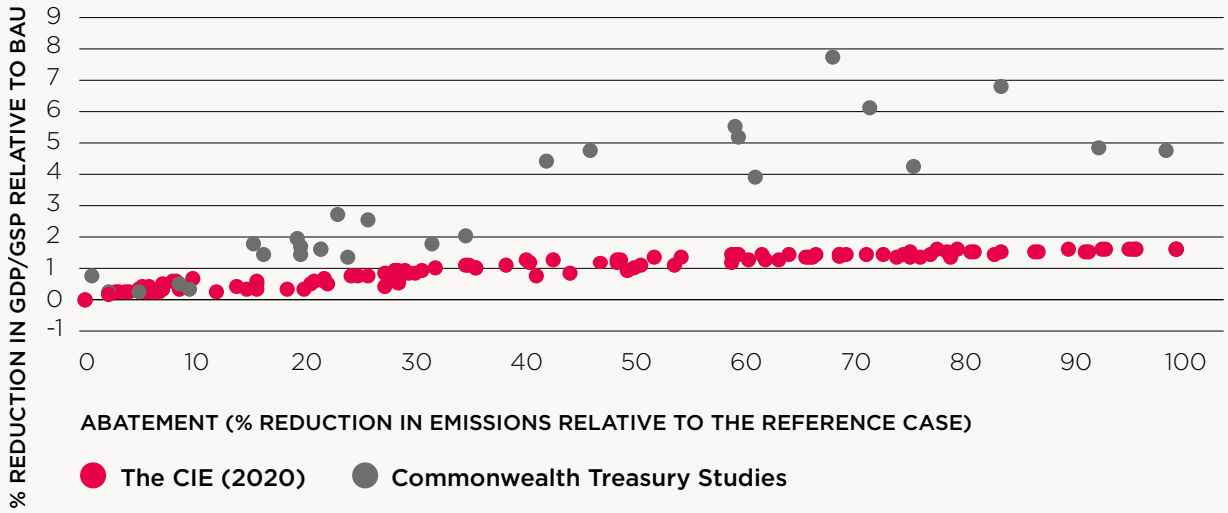
Acknowledging the uncertainty in economic modelling

As discussed in Section 5, the modelling provides useful estimates of the economic impacts of cutting emissions. But, as with any analysis of the future, it remains subject to uncertainty.

While this uncertainty exists in both directions, experience suggests it is more likely that the modelling overstates the cost of reducing Victoria's emissions. Past modelling exercises have tended to underestimate the rate of technology improvement, cost reductions and uptake – and have therefore overestimate the costs of reaching targets. For example:

- The economic impacts projected in the modelling of Victoria's emissions reduction targets are lower than those found in similar modelling by the Commonwealth Treasury[31] a decade ago. This is primarily due to faster-than-expected advances in low-emissions technologies (Figure 8).
- The Victorian Energy Upgrades Program, Victoria's state-wide energy efficiency scheme, has met its targets early and at a lower cost than projected in the modelling. Annual targets for 2016–2020 were delivered at three quarters of the cost estimated when they were set in 2015, and on average these targets have been achieved 193 days early each year.
- The speed and scale of cost reductions in renewable energy and storage have exceeded even the more optimistic projections. Globally, more solar photovoltaic capacity has been installed in five years than was projected to take place in 20 years.[32] In transport, prices of battery packs for electric vehicles have fallen 87 per cent since 2010,[33] with the most optimistic forecasts of prices in 2020 achieved by 2016.[34]

Figure 8: Abatement cost comparison



Source: The Centre for International Economics, for the Department of Land, Environment, Water and Planning

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