



Australia's Low Pollution Future Fact Sheet

The advantages of early action

The report presents a compelling case for Australia to take early action. It shows that economies that defer action lock-in emission-intensive infrastructure, and miss the opportunity of attracting early investment which supports low-emission technologies and processes.

The early mover advantage

There are advantages to Australia acting early if emission pricing expands gradually across the world. Economies that defer action face higher long-term costs, as global investment is redirected to early movers.

The modelling suggests that economies that act early face lower long-term costs: around 15 per cent lower compared to a world of coordinated global action.

In contrast, economies that defer emission pricing become relatively more emission-intensive, so that when a global emission price is eventually introduced they face even higher costs.

Delay increases costs

Delaying mitigation action in the global economy will increase climate change risks, lock in more emission-intensive industry and infrastructure, and heighten distortions associated with trade-exposed industries. This will increase the cost of achieving any given environmental goal.

In a sensitivity analysis where global mitigation action is delayed by seven years, global costs as a share of gross world product are about 10 per cent higher in 2050, and remain higher for the rest of the century.

Early global mitigation reduces long-term costs. Early action allows individuals and firms to plan their adjustment pathways and better manage changes in skills acquisition and capital stocks.

In the face of uncertainty, strong coordinated global action also has an insurance benefit: it keeps open the option of pursuing lower stabilisation levels in the future.



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Alternative Emission Pathways

The stabilisation level of atmospheric greenhouse gases depends on how soon global emissions peak and how quickly they decline.

This report examines four alternative emission reduction pathways for Australia, in the context of global action to stabilise at low levels. Under all modelled scenarios, Australia maintains economic growth while reducing carbon pollution.

Emission reduction scenarios

The report examines four scenarios in which Australia and the world follow different pathways to a low-pollution future. The scenarios are used to explore the potential economic effects of climate change mitigation policy on Australia.

Australia's medium- and long-term emission reduction targets (relative to 2000 levels) in the four scenarios are shown in the following table:

	CPRS -5 per cent	CPRS -15 per cent	Garnaut -10 per cent	Garnaut -25 per cent
Medium-term targets – at 2020				
National	-5	-15	-10	-25
Per capita	-27	-34	-31	-44
Long-term targets – at 2050				
National	-60	-60	-80	-90
Per capita	-77	-77	-88	-93

Reference scenario

The reference scenario assumes current trends in economic activity continue into the future. It does not include the impact of new policies such as the expanded Renewable Energy Target or the Carbon Pollution Reduction Scheme, or the impact climate change itself could have on the economy. This provides a benchmark against which the other four scenarios can be compared.

CPRS -5 and CPRS -15

The CPRS scenarios examine the potential costs of the Government's proposed Carbon Pollution Reduction Scheme. Under these two scenarios, Australia's action takes place within a multi-stage global policy framework. National emission pathways gradually diverge from reference scenario emission levels towards substantial reductions in the long term.

The CPRS -5 scenario is consistent with stabilisation of the atmospheric concentration of greenhouse gases at around 550 parts per million (ppm) by 2100; the CPRS -15 scenario is consistent with stabilisation at around 510 ppm.

Garnaut -10 and Garnaut -25

The Garnaut scenarios were developed jointly by the Treasury and the Garnaut Climate Change Review. These scenarios assume united global action from 2013, representing an optimal post-2012 international agreement. National contributions are based on a contraction and convergence approach, whereby the allocation of emission rights among countries converges from current levels to equal per capita rights by 2050.

The Garnaut -10 scenario is consistent with stabilisation at around 550 ppm by 2100. Under the Garnaut -25 scenario, concentrations peak above 500 ppm, then decline to around 470 ppm by 2100 (consistent with stabilisation at 450 ppm soon thereafter).

Economic growth continues

Under all the scenarios modelled in the report, Australia and the world continue to grow while making the emission cuts required to reduce the risks of dangerous climate change. The report indicates that efficient mitigation policies that price carbon pollution can break the link between economic growth and emissions and lead Australia to a prosperous low-pollution future.



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Economic Impacts

Economic prosperity will continue to grow in a low-pollution future

Australia's economic prosperity will continue

With efficient policy settings, Australia and the world continue to prosper while making the emission cuts required to reduce the risks of dangerous climate change.

From 2010 to 2050, real GNP per capita grows at an average annual rate of 1.1 per cent in the policy scenarios, compared to 1.2 per cent in the reference scenario. Real household income grows at an average annual rate of around 1 per cent in the policy scenarios, compared to 1.2 per cent in the reference scenario.

Stabilising greenhouse gases at lower concentration levels requires faster cuts in global emissions and higher emission prices. Stabilisation at 550 parts per million (ppm) requires an initial emission price of A\$23t/CO₂-e in 2010 in nominal terms. The starting price is 40 per cent higher to achieve 510 ppm and 110 per cent higher to achieve 450 ppm. Higher emission prices generally result in higher aggregate economic costs.

Based on the CPRS scenarios in the report, introducing emission pricing is likely to produce a one-off rise in the consumer price level of around 1-1.5 per cent, with minimal implications for ongoing inflation.

Australia's comparative advantage will change in a low-emission world, presenting new opportunities for our economy. With coordinated global action, most sectors of Australia's economy will grow, low-emissions sectors will grow strongly, and many emission-intensive sectors will maintain or improve their international competitiveness.

The report does not consider the economic impacts of climate change itself, and therefore does not assess the benefits of reducing climate change risks through mitigation. A report released earlier this year by Professor Garnaut estimated the costs and benefits of climate change mitigation and found that the benefits of mitigation outweighed the costs of climate change.

Improving Australia's emissions efficiency

Large reductions in emissions will not require reductions in economic activity.

A market-mechanism will break the link between economic growth and growth in emissions by driving the economy to restructure in response to an emission price.

Demand will shift from emission-intensive products towards lower-emission products, and production methods will switch to less emission-intensive technologies and processes.

This will reduce the amount of emissions per unit of output, allowing incomes to rise while emissions fall. Under the CPRS, emissions per dollar of GDP in 2050 drop to less than one quarter of 2005 levels.

Australia is well placed to reduce emissions

The Australian economy is well placed to face the challenge of responding to climate change. Wide-ranging reforms over the past quarter century have resulted in a flexible, prosperous Australian economy.

The modelling indicates the Australian economy will respond to efficient price-based policies, such as the Carbon Pollution Reduction Scheme, ensuring a smooth transition to a low-pollution future.



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Emission prices

Under the Carbon Pollution Reduction Scheme, the market will set the emission price, not the Government. The price will depend on a number of factors, including the scheme cap, the national emission trajectory, links to international emission markets, and the cost of opportunities to reduce emissions.

Emission prices in Australia

Under a cap-and-trade scheme like the Carbon Pollution Reduction Scheme, the Government sets the scheme cap. This sets the upper limit on the number of permits available in the market.

The price for permits will be set in the market. The price for permits will depend on a number of factors, including the national emission trajectory, scheme coverage and international linking, and the costs of emission reduction opportunities.

The modelling focuses on the medium to long-term economic impacts of policies to reduce emissions. It does not attempt to predict short-term international emission prices.

If there are no restrictions on international emissions trade, Australia's emission price will be determined by the global price. In the scenarios the Treasury has modelled, Australia's emission price is equal to the global price, with an allowance for changes in the exchange rate.

The Treasury modelling suggests that, in the context of efficient market-based global action to stabilise greenhouse gas concentrations at 550 ppm, the initial emission price in 2010 could be around A\$23/t CO₂-e in nominal terms. Stabilising at lower concentration levels requires faster cuts in global emissions and higher emission prices. The starting price is 40 per cent higher to achieve 510 ppm and 110 per cent higher to achieve 450 ppm.

These emission prices are lower than prices currently observed in some emission markets, particularly the European Union Emission Trading Scheme. Higher current prices in the EU market reflect its more limited coverage and restricted access to international trade as compared to the modelled scenarios. The modelling assumes broad coverage of regions and sectors, allowing far more low-cost mitigation opportunities to be captured than in the EU scheme.



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Energy Security

To reduce pollution, Australia must transition to a low-emission energy supply. Australia has a number of options to achieve this transition. The report finds no evidence that pricing emissions will compromise the security of Australia's energy supply.

Transforming Australia's electricity sector

Electricity generation accounts for the largest share of Australia's current emissions, so a significant transition in this sector is required to move Australia towards a low-emission economy. Australia has a wide range of options to assist in this transition, including significant gas, wind, solar and geothermal resources, and the prospect of carbon capture and storage.

Putting a price on emissions will increase investment in renewable energy and other low-emission technologies, changing the technology mix in this sector. This will lead to a progressive transition away from conventional coal-fired generation to low and zero-emission sources of electricity supply. Demand for electricity will also be lower, but most emission reductions will be achieved by reducing the emission intensity of supply.

Faster technological progress in developing low-emission technologies will reduce the costs associated with this transformation. Carbon capture and storage could play an important role in reducing Australia's emissions.

The report finds that introducing an emission price could lead to the early retirement of some emission-intensive coal-fired electricity generation facilities. However, this does not lead to power shortages. New investment in lower-emission generation capacity will be established in sufficient time to ensure demand for electricity is met.

Government steps to assist this transition

The Government has committed to assisting strongly affected coal-fired generators and the employees, communities and regions in this sector, through the Electricity Sector Adjustment Scheme.

The report notes that effective carbon capture and storage technologies are key to future demand for coal in Australia and overseas. While there have been small scale trials of the technology, it needs to be developed at a commercial-scale.

The Government has established a \$100 million Global Institute to speed up the development of carbon capture and storage technology. It has also established the \$500 million National Low Emissions Coal Initiative to accelerate the development and deployment of technologies that will reduce emissions from coal use.



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Household Impacts

Real household income continues to grow strongly, although households face increased prices for emission-intensive products, such as electricity and gas. The Government is committed to helping households adjust.

Household impacts

The report shows that real household income is expected to grow strongly over coming decades in all the scenarios explored. Real disposable income per capita grows at an average annual rate of around 1.0 per cent in the policy scenarios, compared with 1.2 per cent in the reference scenario.

However, there will be impacts. Based on the Carbon Pollution Reduction Scheme scenarios, emission prices could be between \$23 and \$32 per tonne, leading to a one-off rise in the consumer price index (CPI) of between 1 and 1.5 per cent, with minimal ongoing impacts to inflation. Households are expected to spend an average of \$4-5 extra per week on electricity and \$2 extra per week on gas and other household fuels.

As outlined in the *Carbon Pollution Reduction Scheme Green Paper*, the Government is committed to helping households adjust to emission pricing, including by increasing benefit payments and other assistance to low-income households and providing assistance to middle-income households. These measures, together with the automatic indexation of benefits to reflect changes in the CPI, will help minimise household impacts.

Impacts by household types and regions

Lower-income households are likely to be slightly more affected by the introduction of an emission price than other households, as they generally spend a higher proportion of their disposable income on emission-intensive goods, and may be less able to substitute away from these goods. A single pensioner household in the lowest quintile of disposable income faces an average price rise in 2010 of 1.3 per cent, while households in the highest quintile of disposable income face an average price rise of 0.9 per cent. Again, for low- and middle-income households, this will be offset by increased government assistance.

Spending on energy varies across regions, so the impact of emission pricing would be expected to vary across regions. However, the Government's commitment to cut fuel taxes to offset the impact of the emission price on fuel will ameliorate some of the differences between regions. The estimated average price impacts for households located outside a capital city are broadly the same as those for households located in a capital city, with only slightly differing impacts in the highest income quintiles (1.0 per cent compared to 0.9 per cent).



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Impacts on Emission-Intensive Trade-Exposed Sectors (EITES)

Allocation of some free permits to emission-intensive trade-exposed sectors, as the Government proposes, eases their transition to a low-emission economy in the initial years. Shielding redistributes costs from shielded to unshielded sectors and could redistribute costs amongst shielded sectors.

The changing nature of our production

Putting a price on emissions drives a structural shift in the economy, from emission-intensive goods, technologies and processes, towards low-emission goods, technologies and processes. As a result, growth in emission-intensive sectors slows, and growth in low and negative-emission sectors accelerates.

While global demand for some emission-intensive goods and services may fall, many of Australia's emission-intensive trade-exposed sectors (EITES), such as coal, non-metallic minerals, livestock, and iron and steel, are likely to maintain or improve their competitiveness and share of global trade. Overall, these sectors are expected to continue growing, albeit at a slower rate than they would in a world without climate change and emission pricing.

Coal's long-term future depends on developing new technologies — most importantly, carbon capture and storage. With commercially viable technologies, coal is likely to play a major role in future national and global energy supply, and Australian production is likely to grow.

Slower growth in world demand for energy commodities will lower Australia's terms of trade. The exchange rate acts as a buffer to changes in world demand, and would be expected to depreciate. This will improve the competitiveness of other traded sectors, such as manufacturing and iron ore mining.

Australia is likely to lose competitiveness where its production is more emission-intensive than its competitors in other parts of the world.

The impact of shielding EITES

Competitiveness distortions may arise where Australia prices emissions before other economies: EITES could move to other locations that are more emission-intensive than Australia, but not yet pricing emissions. As a result, global emissions could rise, a process called 'carbon leakage'.

The report shows little evidence of any such carbon leakage. This suggests the emission prices in these scenarios were not high enough to induce significant industry relocation. Industry location decisions reflect multiple factors, including access to skilled labour, legal and political stability, access to resources and quality of infrastructure.

Shielding reduces the impact of emission pricing on shielded sectors in the initial years of the scheme. When shielding is applied, output of EITES falls relative to the reference scenario (reflecting the contraction in world demand), but at a more gradual rate. This effect is particularly significant for the aluminium sector. This suggests the shielding arrangements proposed in the *Carbon Pollution Reduction Scheme Green Paper* could ease the transition to a low-pollution future for the shielded sectors.

Shielding is projected to impose modest costs on non-shielded sectors through its impact on permit trading, electricity demand and energy prices. Shielding also redistributes costs amongst shielded sectors, by diverting labour and capital from more to less competitive EITES.

Government assistance to ease the transition to a low-emission future

If Australia prices emissions before its competitors do, some EITES may lose some of their competitiveness. The report finds that the shielding arrangements proposed for EITES in the *Carbon Pollution Reduction Scheme Green Paper* could ease the transition to a low-emission economy, and assist affected industries with the required structural adjustment.

Maintaining clear mitigation incentives for shielded sectors is a crucial part of achieving low cost emission reductions. If the level of shielding is increased, or eligible sectors expanded, this would increase mitigation costs.

The costs associated with shielding highlight the importance of establishing an effective global mitigation framework. Broad participation in international emissions trading, sectoral agreements or equivalent measures could reduce competitiveness distortions stemming from national mitigation policies.



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International Action

Stabilisation is only possible with action by all major emitters. If the world acts now, using efficient policy frameworks, it can lower the cost of reducing carbon pollution globally. Participating in global emissions trading will reduce the cost of Australia's contribution to the global mitigation effort.

Global action and global growth

Australia and global economies will maintain strong, long-term economic growth while reducing emissions. Average annual growth continues at a slightly slower rate across all mitigation policy scenarios, relative to a world without climate change. For example, average annual growth of gross world product (GWP) from 2010 to 2050 is 3.3 per cent in the most ambitious mitigation scenario, compared to 3.5 per cent in the reference scenario. The reference scenario does not include the potential economic cost of climate change itself.

Early global action reduces costs

Early global mitigation reduces long-term costs. Delaying mitigation action in the global economy will increase climate change risks, lock in more emission-intensive industry and infrastructure, defer cost reductions in low-emission technologies and heighten distortions associated with trade-exposed industries. This will increase the cost of achieving any given environmental goal.

In a sensitivity analysis where global mitigation action is delayed by seven years, global costs as a share of GWP are about 10 per cent higher in 2050, and remain higher for the rest of the century.

In the face of uncertainty, coordinated global action also has an insurance benefit: it keeps open the option of pursuing lower stabilisation levels in the future.

If emission pricing is introduced gradually, rather than in all economies at the same time, long-term costs will be lower for early movers and higher for those that delay. Economies that defer emission pricing become relatively more emission-intensive, so that when a global emission price is eventually introduced, they face even higher costs - particularly as global investment is redirected towards early movers. The sooner Australia acts, the lower the cost of the action.

The importance of a global emission market

Like most other developed economies, Australia's pre-existing energy-efficiency standards are higher than in developing economies. Any reduction at the 'margin' is thus more costly.

International emission trading can reduce the cost of achieving Australia's emission reduction goals because it allows mitigation to occur wherever it is cheapest. Across the scenarios, Australia is projected to import permits to meet its emission targets in a cost-effective way. Trade does not compromise the environmental objective, because Australia's 'excess' emissions are offset by lower emissions in economies that export permits.

This highlights the importance of linking the Carbon Pollution Reduction Scheme to market-based schemes elsewhere in the world. This will help reduce the cost of Australia's contribution to the global mitigation effort.



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Long Timeframes and the Global Financial Crisis

The modelling focuses on the medium to long-term transformation of the Australian economy. Market fluctuations, such as the current global financial crisis, will not materially affect the analysis.

Transforming the Australian economy over the medium to long term

The report uses policy scenarios to explore how the Australian economy might change in response to emission pricing. Changes are analysed relative to a reference scenario in which no new policies are introduced.

Like much long-term economic analysis, including that presented in the *Intergenerational Report* (Australian Government, 2007), the modelling focuses on medium to long-term trends in the economy rather than short-run fluctuations.

The actual path of Australian and global economic growth from now out to 2050 will be affected by a wide range of factors. Business cycles and economic shocks, such as the current global financial crisis, will have a substantial impact on the economy in the short term. However, the crisis is unlikely to change the long-run trajectory of the Australian economy. As the modelling is concerned with medium and long-run trends, the financial crisis will not materially affect the analysis in this report.

The modelling measures *changes* in the economy resulting from mitigation policies. In principle, even if the reference scenario was different, the direction and scale of these changes should not be significantly different.

The results would be sensitive to changes that affect the distribution of economic activity between high and low-emission activities. This is why the analysis has been carefully constructed to incorporate the Treasury's best current estimates of longer run trends in the sectoral distribution of output in the Australian and global economies.



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Low-Emission Products and Technologies

Pricing emissions drives a structural shift in the economy from emission-intensive goods, technologies and processes towards low-emission goods, technologies and processes. As a result there will be strong growth in low and negative-emission sectors, such as renewable energy and forestry.

Low-emission goods and services become more competitive

The report shows that demand for low-emission goods and services increases, particularly where they provide an alternative to higher-emission commodities, or an emission trading market creates a new source of revenue.

These effects are particularly evident in the forestry sector. Consumers are expected to substitute towards wood products (a low-emission good) and forests have the potential to sequester carbon and generate credits for sale in an emission trading scheme.

Significant reduction in the emission intensity of transport is also expected, including through changes in the fuel mix, vehicle types and transport modes. Greater use of more efficient vehicle technologies, such as hybrids, and a shift towards smaller vehicles and towards rail, particularly for freight, is projected. Similarly, demand for diesel is expected to rise.

Renewable energy will play a key role

Renewable energy will have a key role to play in reducing Australia's energy-related greenhouse gas emissions. Initially, the primary driver of renewable energy will be the Government's target of 20 per cent of Australia's energy to be sourced from renewable sources by 2020.

In the longer term, the report illustrates that renewable technologies will become increasingly competitive and production methods will switch to less emission-intensive technologies and processes. In particular, electricity generation is expected to move from conventional fossil fuel technologies to renewable sources and carbon capture and storage.

By 2050, the report finds that the share of renewables grows to 40-51 per cent under emission pricing and the alternative energy sector is expected to be up to 30 times larger than it is today, creating significant employment opportunities.

Australia's wide range of low-emission technology options, including geothermal, wind, solar and wave energy could deliver large emission reductions in electricity generation over time, even if some technologies being explored do not prove commercially viable.

Low-emission technologies are important for Australia's mitigation costs

The Carbon Pollution Reduction Scheme will help stimulate the deployment of the many energy-efficient and low-emission technologies that are already available, as well as further research and development of low-emission technologies.

The report indicates that the speed at which low-emission technologies are developed will be important in reducing global and Australian mitigation costs, particularly as technological progress will affect the value of, and demand for, Australia's resources.

Faster technological progress will reduce global and Australian mitigation costs, while slower technological progress will increase costs. For example, Australia's costs as a share of GNP in 2050 are 25 per cent lower under more optimistic assumptions of technological progress and 25 per cent higher if carbon capture and storage is not viable.

Market-based mechanisms reduce the economic costs of mitigation

An accurate prediction of which mitigation opportunities and technologies will be the most cost-effective is impossible. This underscores the importance of broadly-based market-oriented policies, such as the Carbon Pollution Reduction Scheme, that create incentives for mitigation across all sectors without mandating where that mitigation occurs.



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Sectoral Impacts

While mitigation policies result in relatively small costs to the overall economy, the impacts vary across different sectors. A structural shift will occur with the move from high-emission to low-emission goods, services, technologies and processes.

Market-based mechanisms reduce the economic costs of mitigation

A market-mechanism, such as the Carbon Pollution Reduction Scheme, will reduce the risks of climate change at the lowest cost.

It is impossible to accurately predict which mitigation opportunities will be the most cost-effective. By pricing emissions, a market-mechanism creates incentives for mitigation across all sectors without mandating where that mitigation occurs. Emissions reductions will occur where the cost of abatement is lowest, reducing the overall cost to the economy.

Sustained economic growth

The modelling shows that sustained economic growth can be achieved while substantially reducing emissions. Large reductions in emissions do not require reductions in economic activity because the economy restructures in response to the introduction of an emission price.

Impacts will vary across sectors, as the economy shifts from emission-intensive goods, technologies and processes towards low-emission goods, technologies and processes. Almost all sectors of the economy are projected to grow from current levels, but emissions pricing may affect the rate of growth.

For example, emission-intensive sectors, such as coal and gas, are expected to grow, but at a slower rate than they would in a world without climate change or an emissions price. In contrast, growth is expected to accelerate for low and negative-emission sectors, such as forestry and renewable energy.

Australia's comparative advantage

Australia's comparative advantage will change in a low-emission world. While global demand for emission-intensive goods and services is expected to decline, many of Australia's emission-intensive trade-exposed sectors (EITES), such as coal and iron and steel are likely to maintain or improve their international competitiveness and share of global trade.

This is because Australian producers are either less emission-intensive or energy-intensive than comparable sectors in competitor economies.

Australia is likely to lose competitiveness where its production is more emission-intensive than its competitors in other parts of the world.

The report notes that the Government's proposed assistance for EITES as outlined in the *Carbon Pollution Reduction Scheme Green Paper* eases the transition to a low-emission economy for shielded sectors while maintaining incentives for emission reductions.

Other sectors

Demand for low-emission goods and services will grow more strongly, particularly where they provide an alternative to higher-emission goods and services.

These effects are particularly evident in the forestry sector, where the report finds that consumers will substitute towards wood products (a low-emission good), and forests will expand to generate permits for sale in the Carbon Pollution Reduction Scheme.

The pricing of emissions will drive significant changes in the technology mix of the electricity sector. It will improve the competitiveness of renewable energy sources and accelerate the development and deployment of new low-emission technologies such as carbon capture and storage. By 2050, the alternative energy sector will be 30 times larger than it is today.

The transport sector has relatively higher marginal mitigation costs than electricity, so delivers less mitigation in the short term. Nevertheless, emission pricing drives significant reductions in the emission intensity of transport. This will include changes in the fuel mix — such as a move to lower-emission fuels, changes in vehicle types to hybrid and smaller vehicles and changes to transport modes.