The economic impacts of deep cuts to Australia's greenhouse emissions

There is an emerging consensus that avoiding dangerous levels of climate change will require high-income nations to reduce their greenhouse emissions footprint by 60–90% from current levels by 2050. While this is an enormous task, contrary to some views economic modelling of deep cuts in emissions suggests that sensible policy options can achieve reductions of this magnitude with only modest social and economic impacts. **Steve Hatfield Dodds** explains why.

Economic modelling of a 60% reduction in emissions was undertaken for the Australian Business Roundtable on Climate Change (ACG 2006). This assumed that Australia begins serious reductions in emissions from 2013, as part of global action. Reductions in emissions are driven by tradable emissions permits, which are auctioned annually after a 10-year transition period.

This raises significant revenues, which are used to reduce personal income tax and company tax. The scenario assumes that the entire emission reduction is achieved within Australia (without 'buying in' credits from overseas), that carbon capture and sequestration is feasible and becomes cost effective between 2020 and 2025, and that nuclear electricity is not introduced.

Impacts on economic growth and real incomes

The headline economic result is that GDP grows at 2.1% per annum with early policy action, rather than 2.2% per annum without any further action – noting that the modelling does not take account of any possible direct impacts of climate change.

Coal-fired electricity power station at Wallerawang, NSW. Greg Heath, CSIRO

Living standards, meanwhile, continue to rise: private consumption per person rises 80% above inflation over the 45 years to 2050 with policy action, rather than increasing 91% without emissions reductions. Other economic modelling indicates broadly similar impacts, although details vary across models and scenarios (see EFF 2006, Grubb 2006).

Decoupling economic activity and environmental pressure

Introducing an emissions constraint gives economic value to emissions reductions and motivates action. Direct emitters, such as electricity generators, change their fuel mix (away from coal towards natural gas and renewables), and introduce new technologies such as carbon capture and storage as these become cost effective in light of a rising 'carbon price'. Energy users – including consumers and other businesses – choose more energy efficient appliances and technologies, which can reduce energy use while maintaining or improving the underlying energy service provided (such as a hot shower or commuter travel). They also change consumption patterns over time towards products and services with lower embodied emissions and energy. The increased attention to emissions and energy efficiency also has an important role in supporting environmental awareness and helping to identify win-win opportunities to reduce costs and improve the efficiency of resource use.

Revegetation projects also benefit from the introduction of the carbon signal, which provides a new revenue source for biodiversity plantings and other 'carbon sinks' that offset emissions.

The modelling suggests these policies effectively decouple emissions and energy use from economic growth. As shown in Figure 1a, without further policy action these three key variables are all projected to rise substantially. Figure 1b shows that policy action effectively decouples economic activity from energy use and greenhouse emissions – resulting in static energy use (implying falling energy use per person) and very significant reductions in emissions, while maintaining strong economic growth. This decoupling is achieved through improved energy efficiency, adoption of low emissions energy technologies, and some reductions in demand for energy intensive goods and services.

Technicians discuss the raising of a wind turbine head at Crookwell, NSW. Greg Heath, CSIRO

It is worth contrasting the magnitude of the economic and environmental impacts of this set of policies. Annual emissions are 60% lower than current levels, rather than 77% higher. With policy action Australian GDP more than doubles, reaching $2 trillion in 2051, only two-and-a-half years later than it would reach this level without action. The reduction in global emissions associated with this broad scenario markedly reduces the speed and extent of climate change.

Equity and affordability

The introduction of a 'carbon price' through auctioned emission permits increases the price of electricity, petrol and other energy products. These prices increase less than income, however, implying that energy effectively becomes more affordable over time and accounts for a smaller share of household expenditure. A project building on the Roundtable modelling calculates, for example, that the

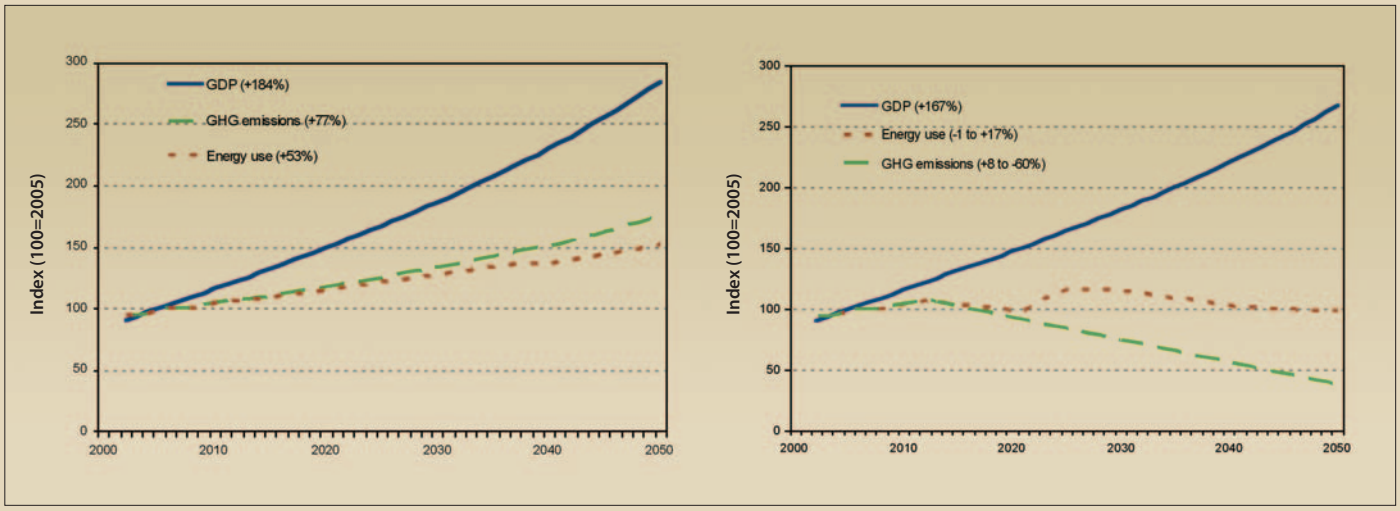

Figure 1a. Economic growth, energy use and greenhouse gas emissions – projections for Australia *without policy action,* 2002–2050.
Source: Calculated from ACG 2006

Figure 1b. Economic growth, energy use and greenhouse gas emissions – projections for Australia *with policy action*, 2002–2050.
Source: Calculated from ACG 2006

Wind-powered electricity generators at Crookwell, NSW. Greg Heath, CSIRO

Taking a long-run view helps to keep greenhouse policy in perspective, and indicates that sensible policy options will have only modest impacts on future incomes and living standards.

income required to purchase the average 2005 household energy bundle would fall from 7% in 2005 to 6% in 2050, even with policy action to achieve deep cuts in emissions (Hatfield Dodds and Adams, forthcoming).

Income and well-being in long-run perspective

Putting these impacts in long-run perspective suggests that small reductions in trend GDP growth are unlikely to have any impact on well-being in Australia.

Since the 1940s there have been over 3000 studies investigating happiness and satisfaction in many different countries (Frey and Stutzer 2002), including four waves of the World Values Surveys across 46 countries since the early 1980s. Researchers ask a variety of questions, including asking respondents to rank their overall satisfaction with life on a scale of one to seven or one to ten. Satisfaction is considered to involve a degree of evaluation or assessment, whereas happiness tends to refer to current mood or emotional state. This data is then evaluated against other individual and social variables, such as income, employment status, household composition, personal beliefs and participation in social activities. This information is gathered through the surveys (allowing comparisons at the individual level) or drawn from official statistics.

This research gives rise to three major insights into the relationship between income and well-being: (i) that reductions in poverty are strongly associated with improvements in well-being across a range of important measures, such as life expectancy, literacy and satisfaction; (ii) that within a single nation or community, there is a weak correlation between higher incomes and higher levels of perceived well-being; and (iii) that increases in average income in developed countries, such as Australia, have little or no impact on average levels of satisfaction or perceived well-being (Helliwell 2003).

The apparent tension between these insights suggests that once basic physical needs are met, perceived well-being is primarily a function of individuals' assessment of life against their expectations and prevailing social norms (acknowledging that factors such as personality type also have some influence). This implies that increasing one individual's income will improve their social position and their ability to meet or exceed their personal benchmarks, and so the increase in income will tend to increase their perceived well-being. Economic growth and increases in average income over time, however, do not result in increased average satisfaction because expectations adapt as fast as income increases.

Figure 2 relates this literature back to economic impacts of reducing emissions. It brings together the historical increase in economic activity per person from 1875, and adds in conservative projections of per capita GDP with and without deep cuts in emissions. The figure shows that income has increased eight-fold since Australian Federation in 1901, and – if we assume the long-term average growth rates – will double again in about 50 years, regardless of whether we make deep cuts in our emissions (Figure 3).

Interpreting the impacts of emissions reductions

Overall, the modelling suggests that early action to reduce emissions is consistent with strong real GDP growth and substantial increases in living standards, and that impacts on energy prices and equity issues are likely to be manageable.

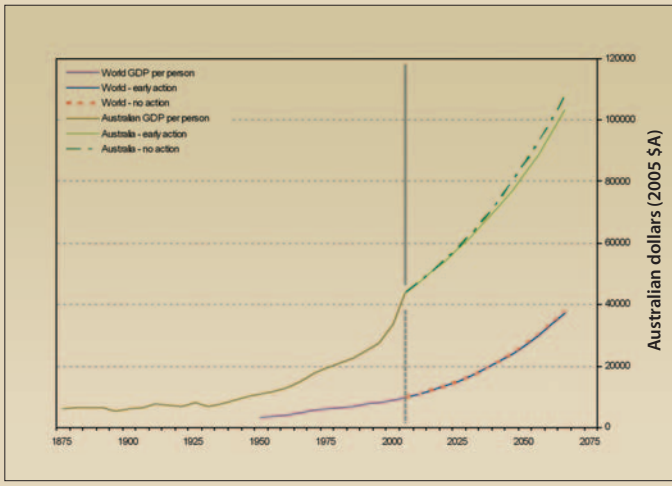

Figure 2. Impact of emissions reduction on economic growth – Australia and the world. Source: Calculated from ACG 2006

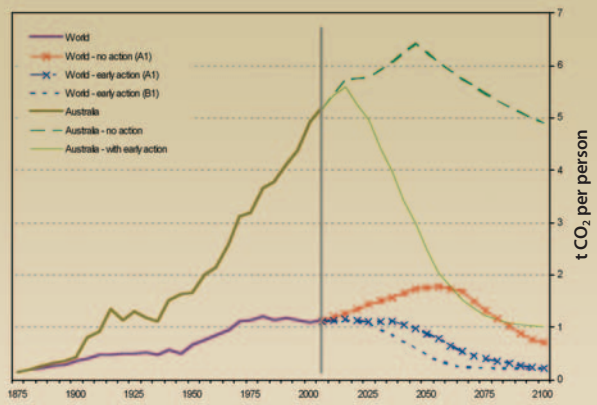

Figure 3. Carbon emission per person – Australia and the world. Source: Calculated from ACG 2006

Taking a long-run view helps to keep greenhouse policy in perspective, and indicates that sensible policy options will have only modest impacts on future incomes and living standards.

The weak link between economic growth and well-being does not provide a licence to implement dumb policy, however. We know, for example, that the rate of GDP growth impacts on unemployment, which is very important to both well-being and social equity.

Over the long term, however, employment and unemployment are determined by real wages and labour productivity rather than by GDP growth. The nexus between economic growth and unemployment relates to deviations from trend – particularly unexpected or abrupt deviations – rather than trend GDP growth itself. This implies that climate change policy should operate within a clear long-term framework and avoid unnecessary short-term shocks.

In a forthcoming edition of *Ecos* we will discuss the impacts of not taking action to reduce emissions, drawing on insights from the Stern Review and the Energy Futures Forum report1 released in late 2006.

A pipeline transporting water down to a valley accumulation station in NSW. Istockphoto

1 http://www.csiro.au/csiro/content/standard/ps2k2.html

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