

# GREEN GOLD RUSH

HOW AMBITIOUS ENVIRONMENTAL  
POLICY CAN MAKE AUSTRALIA A LEADER  
IN THE GLOBAL RACE FOR GREEN JOBS

“For environmental technologies to penetrate and succeed in global markets, it is important that they succeed domestically. Thus, well-designed environmental policies that spur innovation, and government measures that contribute to creating and consolidating domestic markets for environmental technologies constitute a basis for success in global markets.”

- OECD, *Environmental Innovation and Global Markets*, 2008



AUSTRALIAN  
CONSERVATION  
FOUNDATION

**ACTU**

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*Cover photo:* Waubra Wind Farm, courtesy AMWU, Steven Pam / Smartshots 2008

*Cover insert:* Duncan Macgregor, photo courtesy Going Solar.

## FOREWORD

# THE FUTURE OF AUSTRALIA'S GREEN COLLAR ECONOMY

*"For environmental technologies to penetrate and succeed in global markets, it is important that they succeed domestically. Thus, well-designed environmental policies that spur innovation, and government measures that contribute to creating and consolidating domestic markets for environmental technologies constitute a basis for success in global markets."*

**- OECD, *Environmental Innovation and Global Markets*, 2008**

In this time of economic uncertainty, one of the few good news stories is the continued prospects for the growth of green industries. Strong action on climate change will promote green jobs and green businesses and help secure Australia's economic prosperity.

The financial crisis has not diminished the importance of the climate change challenge. Global warming is not something that has appeared overnight and cannot be corrected with quick fixes. Doing nothing will lead to catastrophic consequences for our society and economy – and our planet.

As Professor Ross Garnaut warned recently, it would be poor policy to delay long-term structural change to cut greenhouse emissions because of a short-term response to economic upheaval.

The current global financial crisis has in fact created an opportunity for Australia to consolidate its foothold in green industries. Now is precisely the time to act.

With the right policy settings, we have an opportunity to turn action to combat our environmental challenges into growth of the green economy,

securing jobs and industry well into the future.

This report, *Green Gold Rush: How ambitious environmental policy can make Australia a leader in the race for green jobs*, identifies six 'green collar' industries with great potential for growth and development. These six sectors can drive innovative solutions to meet domestic and global needs while securing economic prosperity for Australia.

The Australian Conservation Foundation and the Australian Council of Trade Unions have jointly commissioned this research to explode the myth that strong action on climate change will destroy industries and jobs.

But our industries will flourish only if we create strong domestic markets, backed by supportive government policies. Other countries have already realised this and are pressing ahead with policies to support their green industries.

This report details where government support can provide the most value and recommends actions for how to make the most of opportunities in these growing markets, with Government, industry and investors all playing a role.

Our organisations and the members we represent are passionate about Australia's environment and determined to work together to forge solutions that protect our environment while securing our long-term economic future.

The opportunity for Australia is tremendous – strong action on climate and industry policy could trigger the creation of an additional 500,000 jobs in these six sectors alone by 2030.

**Don Henry, Executive Director, Australian Conservation Foundation**

**Sharan Burrow, President, Australian Council of Trade Unions**

**October 2008**

## EXECUTIVE SUMMARY

# ENVIRONMENTAL CHALLENGES, ECONOMIC OPPORTUNITIES

Australia, and the world, face unprecedented environmental challenges demanding urgent action: the threat of climate change, pollution and resource constraints.

But these challenges create opportunities. Environmental solutions such as renewable energy, sustainable water technologies and innovative ways of designing buildings and products are generating economic activity.

How Australian governments choose to respond to these challenges and opportunities will have a dramatic effect on the profile of Australia's future workforce.

With the right policy settings, six market sectors currently valued at \$US15.5 billion and employing 112,000 people could grow by 2030 to a value of \$243 billion and 847,000 jobs.

### **Australia's best bets in the future green economy**

1. Green markets and industries, rapidly evolving globally in response to climate change and other environmental challenges, have significant potential for Australian businesses. Overall, global green markets are projected to double from \$US1.4 trillion per year today to \$US2.7 trillion by 2020.<sup>1</sup>

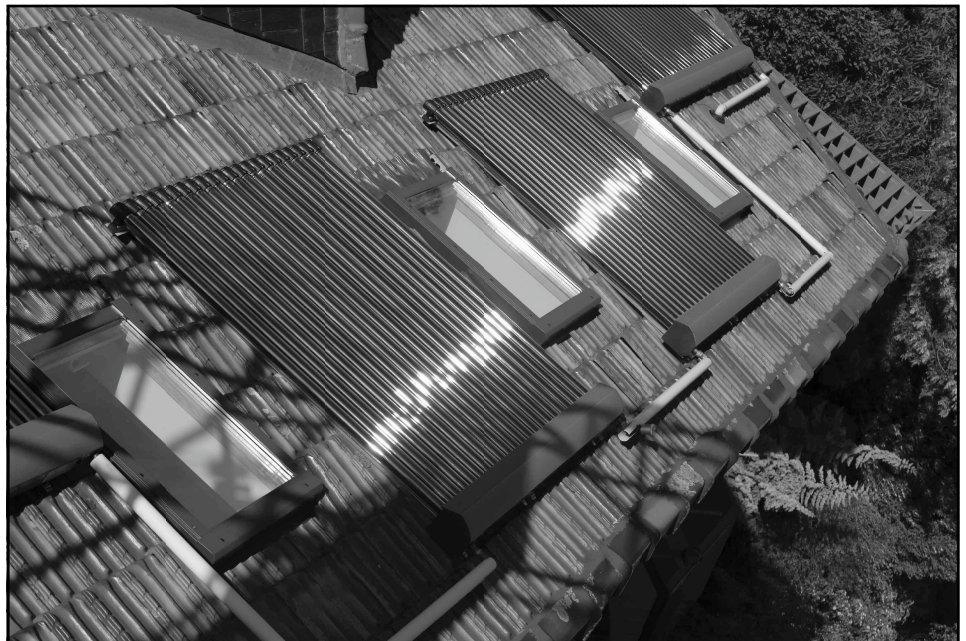
2. Based on analysis of 30 green industries globally, Australian businesses are particularly well-positioned to succeed in the following six key markets:

- Renewable energy
- Energy efficiency
- Sustainable water systems
- Biomaterials

- Green buildings
- Waste and recycling

3. Government policy that creates strong market demand and pathways for industry development can make the difference between lacklustre performance and Australian global leadership in each of these markets.

4. In these six key industries, the creation of strong domestic markets supported by strong climate change and other policies could result in an



*Photo supplied by Alternative Technology Association*

additional 500,000 jobs in Australia by 2030 above a business-as-usual baseline.

5. Inadequate domestic market demand and a failure to address skills and training bottlenecks could result in Australian green businesses moving overseas.

6. There is a strong congruity of views among green industry stakeholders about the measures required for Australia to succeed in accessing global green markets. These views form the basis of the following recommendations.

# RECOMMENDATIONS

## **National leadership on environment and industry policy**

1. Ensure that environmental policy development is informed by sound analysis of the opportunities for creating and meeting demand for green products and services.
2. Set a vision for green industries and 'greening' of all industries within future climate change and economic projections.
3. Demonstrate leadership on international engagement on environmental policy, consistency of industry standards and industry exchanges and promotion.
4. Increase support and facilitate greater collaboration for innovation and commercialisation of key green products and services.

## **National environmental market priorities, industry codes and standards**

5. Set the pollution cap for the Carbon Pollution Reduction Scheme at a level that is consistent with stabilising CO<sub>2</sub>-e concentrations below 450 parts per million (ppm), and commit to reducing pollution further with the agreement of other developed nations.
6. Implement an ambitious national strategy for energy efficiency, including well-designed, appropriately resourced policies to support households, increase commercial incentives to invest in efficiency and improve efficiency standards.
7. Set world's best practice standards and codes for all new and retrofitted buildings and infrastructure, including ambitious building materials, energy and water standards; and invest on a large-scale in retrofitting Australia's existing housing stock.
8. Review and remove barriers for consumers, including removing planning or building control barriers on rainwater tanks, creating strong feed-in tariffs for solar energy and adopting specific measures for rental

properties and low-income households.

9. Facilitate greater private investment into the future green economy by establishing 'green' depreciation and other tax benefits for qualifying investments in industries.
10. Set clear timelines for eliminating categories of waste to landfill and accelerate the development of extended producer responsibility standards for key products.
11. Establish rigorous environmental performance standards for all government operations, including unambiguous procurement mandates that offer preferential consideration and price premiums for green products and services.

## **National strategic industry and skills investment planning**

12. Lift the level of public funding for research and development, education and training, so Australia's investment in these areas is in the top quartile of OECD countries.
13. Improve research and development in environmental technologies by investing in strong public research programs and encouraging private R&D through increased targeted tax incentives.
14. Strengthen engagement between investors and green industries for industry and researchers to showcase new technologies, services and ideas to investors and other stakeholders.
15. Foster the development of green skills in the workforce by identifying key needs through national skills training bodies and stakeholders, allocating a substantial proportion of Productivity Places slots to priority green skills areas and facilitating accreditation standards.
16. Create a national strategic plan for environmental science and skills requirements and green industries development.

# ABOUT THIS REPORT

The Australian Council of Trade Unions (ACTU) and the Australian Conservation Foundation (ACF) commissioned this report from Cambiar to explore the links between strong environmental policies, growth of green industries and job creation..

This report identifies six key green industries where Australia has natural competitive advantages which could be enhanced and commercialised with supportive policies and measures.

The development of these industries can meet the challenge of transforming our economy for a more sustainable future, while securing economic prosperity for Australia. This report details the kinds of government support that may provide the most value for Australia's green industries.

The first section of this report gives an overview of the case for ambitious environmental policies, and shows the potential Australia now has to target green industries as key areas of innovation, job creation and environmental improvement.

The second section outlines the global opportunities in these markets, assesses Australia's areas of comparative advantage, and describes the main areas of action needed from government.

The third section details the job and market opportunities in each of the six industry sectors.

The findings in this report are developed from research and analysis of best available literature and data on likely market developments, together with close consultation with a range of Australia's green industries, including a series of six confidential roundtable discussions held in mid-2008 in Sydney, Melbourne and Adelaide.

ACTU and ACF would like to acknowledge the insights and contributions of the participants in the roundtable discussions. Broadly, the roundtables were of a strong view that policies to underpin strong domestic markets were essential in positioning Australian businesses in green industries in the coming decades.

The findings expressed in this report were informed by the views and contributions of these industry leaders but remain the work of the authors, who take full responsibility for this work.

## Roundtable participants

### Biomaterials

Nick Hayhurst, Plastral Ltd and Australasian Bioplastics Association; Steve Brumbley, CRC for Sugar Industry Innovation through Biotechnology; Matthew Perrier, Plantic Technologies; Mike O'Shea, CSIRO Molecular and Health Technologies; Richard Smith, Amcor Flexibles Australasia; Chris Booth, AusBiotech

### Sustainable Buildings

Jeff House, NSW/ACT State Manager, Green Building Council; David Sharp, Building Products Innovation Council; Paul Moloney, Hyssil; Geoff Lawson, Oncrete; Craig Roussac, Investa Property Group

### Renewable Energy

Rob Jackson, Clean Energy Council; Andrea Gaffney, Solar, Clean Energy Council; Brad Shone, Alternative Technology Association; Andrew Richards, Pacific Hydro; Stuart Bensley, Oceanlinx; Kirsty Norris, AGL; Carlo Botto, TRUenergy

### Sustainable Water

Joe Flynn, Australian Water Industry Alliance; Claude Piccinin, Water Services Association of Australia; Peter Moller, Aqua-Spy; David Aughton, Rubicon Systems; Tim Waterhouse, Sentek; Ian Atkinson, CRC for Irrigation Futures; Paul Smith, Optimatics; David Garman, CRC for Environmental Biotechnologies

### Green Education and Skills

John Spierings, Dusseldorp Skills Forum; Sue Benn, UTS; Janelle Thomas, Australian Research Institute in Education for Sustainability, Macquarie University; Caroline Alcorso, NSW Department of Education and Training; Tom Davies, Environment Institute of ANZ; Anthony Plevey, ee-oz (Industry Skills Council); Frouke De Reuver, NSW Department of Environment and Climate Change; Phil Smith, Australian Association for Environmental Education

### Waste and Recycling

Damian O'Connor, WSN Environmental Solutions; Peter Netchaef, Sims Group; Ramsay Moodie, Fuji Xerox; David Garman, Environmental Biotechnology CRC; John Lawson, Global Renewables; Geoff Potts, Visy



# 1 CREDIT CRUNCH, CLIMATE CHANGE, GREEN OPPORTUNITIES

*"It is critical as we bail ourselves out of this financial crisis, as we inject money into the economy, that we do it in a way that will launch a green revolution... that will leave us with a new infrastructure for a new economy."*

**Thomas Friedman, 15 October 2008<sup>2</sup>**

Australia is in the midst of two major crises: the global financial meltdown and the challenge of climate change. Professor Ross Garnaut has pointed out the differences between these two: whereas the financial crisis is ultimately a short-term phenomenon, however severe, the climate change crisis is long-term and may be irreversible unless we act now.<sup>3</sup>

The confluence of the credit and climate crises has created a remarkable opportunity for Australia to consolidate its foothold in the green industries of the future.

Green industries provide many of the solutions that will be required to reduce our impact on the climate, protect our natural systems and conserve resources. The future economy will be based on products and services that are less energy intensive, more water efficient and based on closed-loop manufacturing systems.

Globally, these industries have been growing at extraordinary speed – running ahead of the rest of the world economy and outperforming major stock indexes in the United States and Europe for the last two years.<sup>4</sup>

Even through the build-up to the current credit crisis, green industries have continued to expand response to regulatory change and market opportunity. While other markets declined sharply in 2008, carbon markets grew by 81 per cent over the first nine months of 2008, reaching \$US87 billion by the end of September.<sup>5</sup>

This strong growth in green industries is not likely to taper off. To give just one example, in March 2008 China's National Development and Reform Commission doubled its 2010 wind energy target

from 5 GW to 10 GW. According to some projections, China may achieve 100 GW by 2020.

The exponential increase in global demand for green products creates a moment in time to put Australia's best foot forward. By building on our natural advantages – a strong scientific and innovation culture, natural resources, and proximity to Asian markets – Australia can lead the way with environmental solutions.

Such a move can spearhead the transformation of Australia's economy. It can bring economic, environmental and social wins to the nation while expanding our exports and making Australia's international trading position more resilient and relevant to the future. The architecture of Australia's national environmental and industry policy will play a crucial role in determining the success or failure of Australia's budding green industries.

*"For environmental technologies to penetrate and succeed in global markets, it is important that they succeed domestically. ... [G]overnment measures that contribute to creating and consolidating domestic markets for environmental technologies constitute a basis for success in global markets. Gaining market experience at home is especially important in the case for small and medium-size enterprises."*

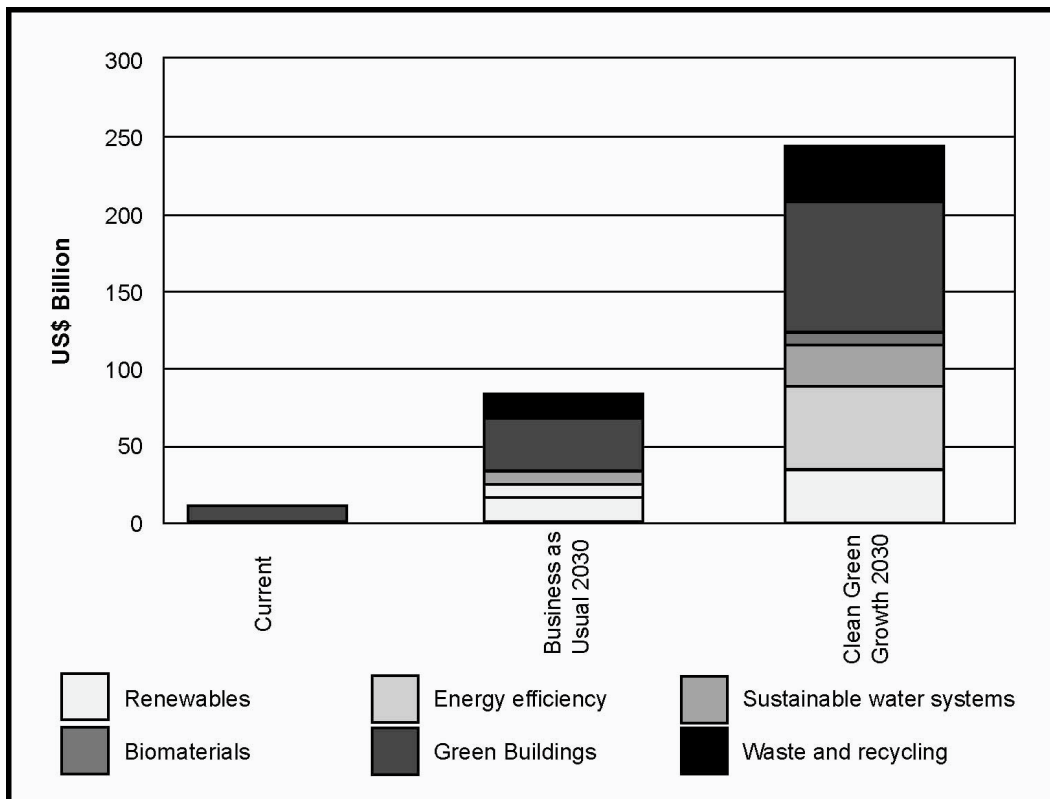
**OECD, *Environmental innovation and global markets*, 2008<sup>6</sup>**

## **Ambitious environmental policy: a catalyst for market success**

The increasing realisation that global economic prosperity and employment depends on a stable climate and healthy ecosystems is spurring investment in green products and services.

As the OECD has recognised, strong environmental policies can no longer be regarded as a burden to economies. On the contrary, ambitious environmental policies have an impressive track record in generating innovation, industry development, job creation and economic prosperity.

*Figure 1: Projections of Australian market share for six green industries to 2030*



The case of Germany provides a good example of where active environmental industry policy has led to the development of strong domestic markets, which in turn have enabled German businesses to be highly successful in global markets.

Beginning in the early 1990s, Germany introduced a suite of policies aimed at deliberately fostering renewable energy through direct investment, government incentives, strong feed-in tariffs and other complementary policies. As a result, the share of electricity in Germany generated from renewable sources increased from 3 per cent to almost 9 per cent between 1990 and 2003.<sup>7</sup>

Building on strong domestic capacity, Germany has proceeded to establish a leading position in global renewable energy markets, accounting for 32 per cent of global solar photovoltaic production and nearly 30 per cent of wind turbine production.<sup>8</sup> Analysts now rate Germany as by far the largest photovoltaic market, with a turnover in 2006 of €3.7

billion and massive jobs growth.<sup>9</sup>

Germany has since introduced a New Deal for the Economy, Environment, and Employment, which identifies the positive role that the state can play in creating an “ecological industrial policy”. This approach highlights the importance of generating strong market demand for environmental products and services.

Denmark has had similar success in triggering an internationally competitive renewable energy industry through domestic market stimulation.

Strong feed-in tariffs introduced in the 1990s made wind energy competitive in the Danish electricity market.<sup>10</sup> By 2006 Denmark had 3,100 MW of domestic wind capacity, representing 20 per cent of its domestic electricity needs.<sup>11</sup> But just as important, Danish firms had developed the expertise and production capacity to succeed in global wind turbine markets.



India has emerged recently as one of the world's fastest growing markets for green buildings, a result of its ambitious home rating schemes and building codes. These have opened up a range of opportunities in construction, architecture, engineering, building materials and equipment manufacture.<sup>12</sup>

Adopting ambitious environmental policies can be a driver for global leadership for Australia as well. The accompanying charts (Figures 1 and 2) indicate the difference for Australian jobs and economic value that strong domestic markets, underpinned by supportive environmental policies, could make in six key green industry sectors.

In these charts, the 'business as usual' scenario represents a growth trajectory based on existing policy settings and likely global and domestic developments. The 'clean green growth' scenario shows a trajectory that could result if Australia acts early to encourage the development of these industries

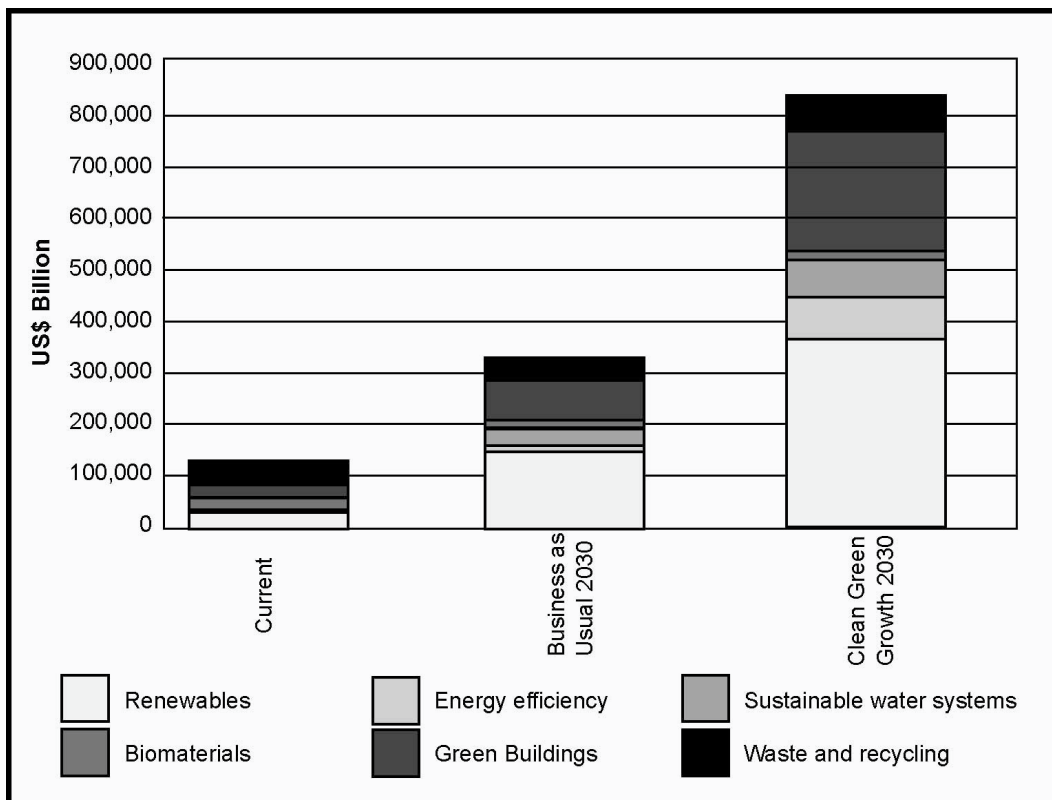
through a combination of policies to promote both 'technology push' and 'market pull'.

The market value and jobs estimates include activity by Australian based companies operating in the domestic market and overseas. It is expected that Australia's main destination for exports of products and services will be Asia, and, in particular, the continually expanding markets of China and India.

By taking bold action to protect the environment and stimulate green industries, Australian governments could make a decisive difference in creating industries that employ 500,000 more workers than what might otherwise occur.

The opportunities within each of these industry sectors and the policies and enabling actions that will be needed to unlock the potential are described in more detail in the following sections.

*Figure 2: Projections of Australian jobs for six green industries to 2030*



## 2 UNLOCKING AUSTRALIA'S GREEN INDUSTRY POTENTIAL

A successful environmental industry policy must be founded on a solid appreciation of the global market developments, an understanding of Australia's areas of relative advantage, and focused policy measures to underpin success for these industries. Deliberate decisions are required to focus in areas where comparative advantage exists and strategic business interests overlap with environmental imperatives.

### **Taking the measure of global environmental markets**

Environmental challenges are creating immense opportunities for next generation technologies as governments respond to impacts and resource constraints associated with areas such as energy, water, waste, urban design, and materials.

Overall, global green markets are projected to double from \$US1.4 trillion per year today to \$US2.7 trillion by 2020.<sup>13</sup> As a comparison, the gross domestic product of the United States reached \$US13.8 trillion in 2007.

Clean technologies indices are now consistently outpacing the broader market. In 2007, institutional investors allocated \$US23 billion in funds to green equity investments while private equity investments totaled \$US50 billion. While there have been relatively fewer transactions in 2008 due to global capital market conditions, the value of deals concluded in just the first six months of 2008 exceeded the levels of the full year 2005.<sup>14</sup>

As a proportion of global venture capital investment, green industries are up from just 1.6 per cent of total investment in 2003 to 11 per cent in 2008. And in terms of value, global venture capital investment in these industries in 2008 is expected to exceed the record \$US3 billion invested last year, having reached \$US2.2 billion in the first six months of 2008.<sup>15</sup>

The value of sales from green energy sources like wind, solar and geothermal power and biofuels will continue to grow to as much as \$US1 trillion a year by 2030, according to investment analysts.<sup>16</sup>

The global green market is largely being driven by the gathering impetus behind the world's response to climate change. For instance, in spite of difficult conditions on the credit markets, the renewable energy sector powered ahead in 2007, according to analysts at New Energy Finance. With 31 GW of new installed generation, sustainable energy accounted for 23 per cent of new power capacity added globally in 2007.<sup>17</sup>

More than \$US148 billion in new funding entered the renewable energy sector globally in 2007, up 60 per cent from 2006. Wind energy attracted the most investment (\$US50.2 billion in 2007), but solar power grew most rapidly, attracting \$US28.6 billion of new capital and growing at an average annual rate of 254 per cent since 2004.<sup>18</sup>

The highest levels of renewable energy investment are in Europe, followed by the USA. However, China, India and Brazil have been drawing growing investor interest, their collective share of new investment growing from 12 per cent in 2004 to 22 per cent in 2007, representing an increase in absolute terms of 14 times, from \$US1.8 billion to \$US26 billion.

With the move towards a low-carbon and more sustainable world, growing numbers of jobs are being created in these sectors. A recent study by the United Nations Environment Program documented major growth in green industries, from standing starts to some 300,000 workers employed in wind power globally and 170,000 in solar photovoltaics.<sup>19</sup>

Almost 1.2 million workers are employed in generating biomass-derived energy in just four leading countries: Brazil, the United States, Germany and China. Overall, the number of people presently employed in the renewable energy sector runs to about 2.3 million.

### **Australia's comparative advantage**

Australia's history of scientific and innovation capacity, educational excellence, access to Asian markets and our natural resource base gives us competitive advantages in several green industries.

The unique combination of being a developed country that is geographically isolated and with harsh climatic conditions has driven an innovative, self-reliant culture in Australia. As a result, Australians' capacity for environmental innovation is among the best in the world. This tradition of innovation, complemented by high education and skills levels, has underpinned Australia's leading reputation in environmental science, and technological research and development.

The diversity of Australia's environment and climate has meant innovative solutions for domestic challenges have been tested under the same conditions applying to many places around the world – including in some of the world's fastest emerging economies like China and India.

Australia's strong scientific and innovation capacity is complemented by a world class education system and highly developed skills and training capacity. As a result, Australia's forté is in high-end value added products and services.

Access to abundant natural resources also sets the scene for success in a number of green industries. While Australia's mineral wealth may come first to mind, in the long-term our renewable energy resource may prove to be more important. There are few countries in the world with either the diversity or quantum of Australia's renewable energy resources, which include solar, geothermal, wind and wave resources. These provide a strong basis for commercialisation of new renewable technologies.

We have a highly urban yet dispersed population but have constructed cities regarded as amongst the world's most 'liveable' and desirable. This has given rise to competitive advantages in the green building field as well. The skills base already exists here and, combined with our proven capacity in innovation, is key to Australia's competitive advantage.

Perhaps the greatest area for demand and market for growth from innovation is in water-related industries. Australia is among the world leaders in

key areas of water management – including in precision irrigation, agricultural efficiencies, water trading mechanisms, and asset management. We live on the world's driest inhabited continent yet have managed to become a significant agricultural supplier to the world.

However, Australia has had mixed success in translating its innovation capacity and natural resource advantages into business success in green industries. In some areas, such as green building design, recycling and water efficiency technologies, Australian businesses have been moderately successful in accessing overseas markets.

However, in other areas, particularly solar energy and other renewable energy technologies, some of Australia's most promising technologies have been commercialised overseas due to a lack of political interest and investment support here.

### **Six green industries poised for success**

By focusing on the segments with greatest existing competitive advantages, Australian policymakers will maximise the chance of Australia succeeding in future green markets.

Australia will have the greatest chance of success by focusing policy support on industries where the following criteria are fulfilled:

- Strong projected domestic and global demand;
- An existing Australian industry and R&D base that is energetic, ambitious, leading the way on technological development, and possessing the capacity to respond well to domestic policy levers;
- The existence of policy options that can stimulate demand while increasing environmental protection and/or improving resource efficiency.

Using these criteria, Cambiar assessed 30 potential green industries in an effort to identify those with the most promise for Australia. The process of assessment involved informal consultations with a

wide range of industry experts, as well as qualitative and quantitative assessments of likely future market trends and regulatory options.

The following six industries show greatest promise for Australia and are the focus of this analysis:

- Renewable energy
- Energy efficiency
- Sustainable water systems
- Biomaterials
- Green buildings
- Waste and recycling

For each of these sectors, the capacity and desire of the industry to pursue global success was tested at a confidential industry roundtable session. For each of these six sectors, industry participants overwhelmingly held the view that Australia was well-positioned to succeed. Strong domestic demand, long-term policy support, and ongoing skills and training requirements were identified as priorities in each of these sectors.

Significantly, there was strong business support in each sector for ambitious policies to reduce greenhouse pollution and improve efficiency. The policies listed as recommendations in the beginning of this report were all tested with the relevant industry sectors at these roundtables.

Across industry and stakeholder groups there is strong enthusiasm for capitalising on Australia's capacity for innovation and for matching the best in the world. There is a belief that supportive policies and measures can position Australia as a key supplier of environmentally sustainable solutions to a global community now grappling with serious environmental challenges – challenges not unrelated, but on a vastly bigger scale than those which Australia has had to deal with.

## **Solutions: National leadership and direction**

**Strong national leadership and direction, backed by a commitment to action, will be central to Australia's ability to capitalise on opportunities in the green economy.**

There was a strong consistency of messages from the stakeholder roundtables held for this report: each sector agreed on the benefit of clear and ambitious environmental policy in their area, matched with industry policy to support the companies and research producing the solutions. There are promising signs that alignment of environmental and economic agendas of this kind is possible and is supported, including in the Australia 2020 Summit<sup>20</sup>



*Shaun Blackie at Pacific Hydro's Chalicum Hills wind farm.  
Courtesy of Pacific Hydro*

and the Garnaut Climate Change Review.<sup>21</sup>

The Federal Minister for Innovation, Industry, Science and Research has emphasised the need for Australia's manufacturing industry to be ready to innovate and export, to be efficient and outward looking, to invest in local know-how to create competitive advantage.<sup>22</sup> Responding to potential in the green economy is one way to do all these things.

Australia has the opportunity to consolidate and strengthen its leadership in the six key industries discussed in this report. These sectors had been growing in response to a number of challenges unrelated to the current global economic slowdown, such as climate change and water scarcity.

The national direction should link Australia's research agenda, innovation policy and industry policy (including manufacturing), and their relationship with trade, aid and diplomacy agendas. Showing leadership on the international stage is equally important: a consensus on global approach to solving climate change will help develop the markets for goods and services in which Australian businesses can succeed.

Bringing industry policy together with environmental policy will optimise the response by Australian businesses and create the critical mass for market development domestically and market access globally.

A useful framework, supported by the roundtable participants, for considering how governments can support innovation and green industry development is shown in the diagram below, as developed by the economist Michael Grubb.<sup>23</sup>

The importance of this diagram is that it shows the complementary nature of 'technology push' policies, which foster the early developmental stages of new technologies and businesses, and 'market pull' policies, which support commercialisation. In-between the two are a range of deployment policies which are necessary to support technologies in the pre-commercial transitional phases – often known

as the technology 'valley of death'.<sup>24</sup>

The diagram also shows that strong research and development in a nation is not sufficient to ensure economic success if domestic markets are not adequate to move innovations through the stages of commercialisation. In such cases, the absence of policies to encourage market development can be fatal to new industries. Indeed, the lack of a reliable domestic market is widely held to be responsible for the move of many of Australia's important solar energy technologies offshore.

Government intervention can accelerate change in green industry – setting a clear direction, supportive policies, investment and working with stakeholders. If governments establish the right regulatory and market frameworks, the private sector will ultimately do the 'heavy lifting' by investing in new technologies and services and developing the business and people to deliver them.<sup>25</sup>

### **Solutions: Developing environmental markets**

There was a strong consensus among participants in the industry roundtables that it was appropriate for governments to view environmental policy as a means of accelerating market pull. The barriers that such support can help overcome include the following:

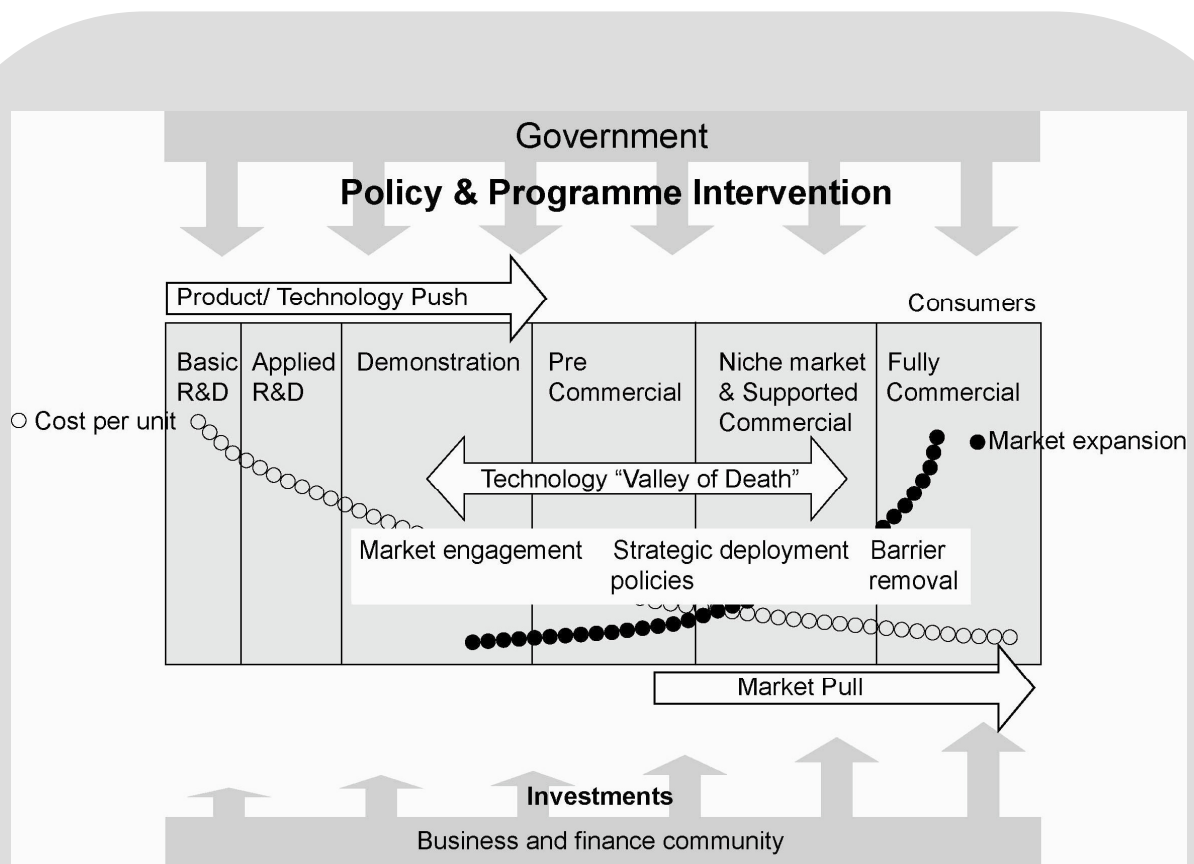
- *Costs and timeframes required for commercialising new technologies and services.* First movers face higher initial costs to overcome barriers such that it is difficult to recover sufficient additional costs from early markets.
- *The undifferentiated nature of the products and services in certain sectors (e.g. source of electricity has no physical difference to consumers) creating difficulties in charging sufficient premium.*<sup>26</sup>
- *Market regulation* limiting ability to recoup higher costs of premium products due to regulated pricing regimes, e.g. in water and energy supply and/or insufficient access to

competitive markets.

- *Removing barriers* from uptake due to novel goods not fitting with existing regulation, or existing regulation preventing innovation e.g. removing planning or building control barriers to rainwater tanks.
- The *disproportionate power of incumbency*,

which can restrict market access for innovators. Incumbents often receive indirect subsidies, and have greater lobbying power than new innovators.

- *Higher initial cost* for novel products and services, especially if new infrastructure is required.



- Basic research and development: testing and developing new ideas.
- Applied R&D: Technology-specific research, development and demonstration.
- Market demonstration: of technologies to show to potential purchasers and users that the technology works in real-world applications, and to test and demonstrate its performance, viability and potential market.
- Pre-commercialisation: both the adoption of the technology by established firms and the establishment of firms based around the technology.
- Niche market and supported commercialisation: market accumulation in which the use of technology expands in scale, often through accumulation of niche or protected markets.
- Fully commercial: diffusion on a large scale.



- *Consumer reticence to use novel products until they are familiar, or tried and tested.*

A range of measures, including in the field of environmental policy, can enhance and accelerate 'market pull' from domestic markets and export markets.

- *Market mandates* can support markets until they become commercially viable. Provides initial opportunities for innovators to receive a return on investment, and to enable learning-by-doing opportunities. Setting minimum performance standards is one example of a market mandate, and the use of government procurement policies is another.
- *Differentiating products* – accreditation, product labelling and information provision – creating confidence in consumers in green premium goods and services.
- *Subsidising pioneer consumers* – in goods and services which has environmental and social benefits e.g. domestic scale renewables.
- *Niche market establishment* can involve the rolling out of Government-supported programs where public support may cover a component of the costs (such as administration and management).
- *Fiscal incentives*, such as 'green' depreciation of assets which reduce energy and water use supports the uptake of technologies (and can help reduce commercialisation costs).
- *Facilitating access to international markets and promoting Australian goods and services internationally.*
- *Ensuring that public procurement* is based on preferences for environmentally sustainable goods, including the willingness to factor in a price premium and clear oversight of the sustainability performance of public agencies.

The following policies would significantly assist in the development of domestic markets for Australia's green industries:

- Set the pollution cap for the Carbon Pollution Reduction Scheme at a level that is consistent with stabilising CO<sub>2</sub>-e concentrations below 450ppm, and commit to reducing pollution further with the agreement of other developed nations.
- Implement an ambitious national strategy for energy efficiency, including well-designed, appropriately resourced policies to support households, increase commercial incentives to invest in efficiency and improve efficiency standards.
- Set world's best practice standards and codes for all new and retrofitted buildings, including ambitious building materials, energy and water standards and invest on a large-scale in retrofitting Australia's existing housing stock.
- Review and remove barriers for consumers, including removing planning or building control barriers on rainwater tanks, creating strong feed-in tariffs for solar energy and adopting specific measures for rental properties and low-income households.
- Facilitate greater private investment into the future green economy by establishing 'green' depreciation for qualifying investments in industries.
- Set clear timelines for eliminating categories of waste to landfill and accelerate the development of extended producer responsibility standards for key products.
- Establish rigorous environmental performance standards for all government operations, including unambiguous procurement mandates that offer preferential consideration and price premiums for green products and services.

**Box 1: Summary of Cutler Review recommendations that would support Australia's green industries<sup>29</sup>**

- Establish a *new National Innovation Council* to replace the Prime Minister's Science, Engineering and Innovation Council. The Council would be charged with the ongoing evaluation and identification of national priorities and synergies across innovation programs. It would be required to achieve the coherence, flexibility and responsiveness necessary for effective innovation policy.
- Invest in developing *high quality human capital*, which is critical to innovation. Equipping our people with the skills to innovate is essential – for the generation and application of new knowledge and also to use and adapt knowledge produced elsewhere.
- Building high quality human capital requires Government to *invest at all levels of education* – from early childhood education and schooling, through vocational education and training and higher education, and into the workplace. Using public education spending as a yardstick, national commitment to developing high quality human capital has been waning both as a share of our own economy and relative to other countries.
- *Recast Australia's innovation policy* to give priority to strengthening innovation at the point where business enterprises and workplaces engage with the markets and customers.
- Urgently *restore public funding levels for research* in universities and government research agencies – by 2020 Australia should match the top quartile of OECD countries in public expenditure on R&D. A significant portion of research funding should align with national priorities.
- Transform and rationalise the suite of available *tax concessions* – the basic concession should be increased and recast as a 40 per cent tax credit. For small firms increase the rate of assistance further, lift the threshold that defines 'small firm' from \$5 million to \$50 million, and remove the expenditure threshold on R&D altogether.
- *Establish a new program to assist innovative firms in the high-risk early stages* of proof of concept and development, together with an expansion of the Enterprise Connect program to build innovation performance and capacity in firms and to allow access by services firms.
- *Maintain and extend the Innovation Investment Pre-Seed Fund programs* to support capital raising by early stage companies to address the systemic funding gap in the availability of capital for early stage ventures.
- *Continue the Commercialising Emerging Technologies (COMET) program.*

## **Solutions: Reforming Australia's innovation system**

Innovation policy must go beyond the abstract. Australia, as any nation, has specific comparative advantages in specific industries, and it makes sense to play to our strengths and foster those businesses that are both competitive and environmentally innovative. Once key green industries are identified, action plans can then be created to overcome challenges, improve enterprise performance and deliver solutions at a large scale.<sup>27</sup>

The Government recently received the report of the Cutler Review of the National Innovation System, commissioned to investigate areas for improving Australia's innovation system.<sup>28</sup>

The Cutler Review identified two key reasons for reforming the innovation system.

First, Government support for science and innovation has fallen by nearly one quarter since the early 1990s.

Second, national productivity growth, a measure of success in embracing innovation, began lagging behind the average for OECD countries from around 2002.

The key recommendations from the Cutler review are sound and their adoption will help ensure government support for innovation fosters a transformation of Australia's industries to meet environmental challenges (see Box 1).

In addition, support for public and private research and development for green industries must remain at the heart of sound Australian industry policy.

This means additional funding to support research in universities, CSIRO and Cooperative Research Centres; the establishment of incubators to link research outputs to markets, and increased taxation benefits for private sector investment in R&D that involves environmental benefits. Australia should aim to be in the top quartile of OECD countries in public R&D expenditure.

## **Solutions: Financing of innovative green industries**

Alongside direct investment in research and development, the government should actively facilitate access by Australian investors to emerging green businesses, through engagement from sector leaders and organising industry exchanges to bring investment experts to Australia.

Although significant investment opportunities in green industries exist, Australian investors lag behind our major developed world trading competitors in taking up these opportunities. Current Australian venture capital investment totals just 4 per cent of the US and 6 per cent of Europe.<sup>30</sup>

The conclusion drawn from industry roundtables is that Australia's investors are yet to be effectively engaged by opportunities in green industry.

The main actions required are to build an understanding of opportunities with Australian investors, and to overcome specific barriers related to Australia's modest market size, the high costs of assessing initially small ventures, and similar structural obstacles. Possible activities could include:

- *Sector leaders should target investors, particularly those involved with angel investment, venture capital and private equity, to build their understanding and awareness of opportunities and risks. Case studies of investment deals, along with investment trends within the sector, should be provided.*
- *Direct engagement between investors and green industries can be facilitated through initiatives such as the Water Pitchfest, an annual forum for industry and researchers to showcase new technologies, services and ideas to investors and other stakeholders (see Box 2 below).*
- *Organise industry exchanges to bring investment experts in green industries to engage local investors, industry and researchers.*

## **Solutions: Developing environmental knowledge and skills**

*“The structural changes that will emerge in a low-emissions, growing economy will change requirements for human capital. In Australia, a history of skills development has been inherent in a globally successful resources sector. Australia should be structurally well placed to apply such skills to new activities.”*

**- Professor Ross Garnaut**

Education and skills training on environmental

issues is a critically important enabler of Australia’s ability to capitalise on green industry opportunities. It encompasses Australia’s human capacity in research and development, the formal education of people with specialist green skills and capabilities, and the green skilling of the current workforce. Equally important is consumer education, which by building environmental awareness helps to stimulate domestic markets for green products and services.

To provide a skilled workforce for Australia’s green

### **Box 2: Water Pitchfest – linking innovators and investors**

Water Pitchfest is a forum for industry, researchers and investors that showcases new technologies, services and ideas.

Ten innovators from industry and academia present their technologies and ideas to investors and other stakeholders. They set out their vision and the benefits of their innovation, and outline what support is needed to make to progress.

Pitchfest provides pitchers with a forum to showcase their technologies and services and make contacts that could potentially support and further their ideas. It is supported by the Water Industry Alliance and the Water Research Cluster of the University of Adelaide.

Pitches are screened by the event facilitators, who also coach the innovators in drafting and delivering their pitch.

Participants in this year’s Pitchfest heard from:

- *Mark Lobban, Reclaim Water*, presented its branded Reflow technology, a state of the art wastewater recycling technology based on rapid oxidation. The technology is patented and fully scalable, and Reclaim Water is looking for a large investor to take its operation to the global market place.
- *Adrian Hunter, University of Adelaide Water Environmental Biotechnology Laboratory*. His technology takes wastewater from the potato chip or wine industries to produce clean water and fungal biomass that is a valuable protein-rich animal feed.
- *Jamie Miller, Somnium Innovations*, is developing an algal based water technology system to treat heavy metal and acidic waste waters from the mining industry. Somnium Innovations has a provisional patent in place and is in the early stages of development. The company plans to have a prototype by June 2009 and is looking to raise funds leading up to that.

economy, policies are needed to:

### **Establish a national action plan for green skills development.**

The plan should set out the scope and steps that will be taken to address existing and projected green skill shortages. Current initiatives around green plumbing could prove useful models to integrate into the national plan. In all cases it will be important to maintain a focus on operating at the interface between education and skills training and job opportunities and needs in the workplace. To be most effective, skills training should be linked to employment opportunities and skill loadings. The plan should include at least the following components:

- Accredited courses formally recognising green ‘practitioners’ should be further created and disseminated across vocations and professions.
- A significant proportion of slots in the Commonwealth Productivity Places Program should be allocated to green skills development.
- National skills training bodies and stakeholders, including Skills Australia, should identify and promote the development of skills that will be required to create a low-carbon, sustainable future, with a focus on current high-impact industries.
- The development of ‘centre of excellence’ hubs in key skills areas would facilitate the advancement of skills expertise.

### **Lift the level of public funding of education and training.**

As set out by the Cutler Review, Australia should match the top quartile of the OECD in public expenditure on education, vocational education and training. Without this investment we will not be able to develop the high quality human capital that is critical to innovation and productive industry.

CSIRO modelling, on the impact of ambitious

emissions reductions targets, suggests that 2.5 million additional jobs will be created to 2025. The report adds: *“The real challenges will lie in providing appropriate skills to these new workers while also supporting the re-skilling...[of existing workers]”*<sup>31</sup>

### **Promote awareness raising and education on resource efficiency and pollution reduction to drive wholesale adoption of new practices and accelerate demand for green products and services.**

Education and training in environmental issues are needed at all levels of organisations, as well as measures and tools to assess and mitigate environmental impacts. Strategies may include:

- Expand green education in executive, strategy and finance roles, to meet needs from increases in corporate responsibility for environmental management and risk and enable integration into business strategy and planning.
- Assist in the penetration of skills and tools to comprehend environmental impacts and mitigation measures with model ‘organisational environmental management systems’.
- Support and funding is needed for professional development training to address environmental challenges and their solutions, for example, skills shortages in environmental impact and cost benefit analysis was brought to our attention in roundtables.
- Integrate environmental education across all curricula. Greater awareness of environmental issues and their solutions helps drive regulatory, consumer and business responses
- Share best practice across sectors. Government can help ensure the many examples of best practice are shared across the diverse group that provides environmental education and skills training. An important part of this process is ensuring the transfer of best practice across the interface between education, training and industry.

### 3 AUSTRALIA'S BEST BETS IN THE FUTURE GREEN ECONOMY

With the right supportive policy frameworks in place, Australia is well placed to punch above its weight in the green markets of the future.

The following pages contain descriptions of the potential of six key growth industries in which Australian businesses are poised to succeed globally, with the right combination of domestic market demand and facilitative policy frameworks.

Collectively, these six industries could be generating \$US243 billion in investment for Australia and employing 847,000 workers by 2030.

The challenge is clear, and only by setting our sights high will Australia realise the full potential of its green industry leaders.

*Table 1: Projections for a green collar economy*

	Now		2030 – BAU scenario*		2030 – Clean green growth scenario	
	Market (\$US billion)	Jobs (thousands)	Market (\$US billion)	Jobs (thousands)	Market (\$US billion)	Jobs (thousands)
Renewable energy	1.4	20	15	150	38	375
Energy Efficiency	1.25	5	10	15	50	75
Sustainable water systems	2.5	25	9	30	25	66
Biomaterials	0.02	0.2	1	14	12	36
Green Buildings	2	23	31	77	81	230
Waste and recycling	8.3	39	13	42	37	45
<b>Total</b>	<b>15.5</b>	<b>112</b>	<b>79</b>	<b>328</b>	<b>243</b>	<b>847</b>

\* BAU: Business As Usual



# RENEWABLE ENERGY

Renewable energy is energy conversion technologies that depend on renewable resources, such as wind, solar, ocean and biomass. Large hydropower has been excluded from most of this analysis, unless specified otherwise.

## Target 2030

Australia should aim to build a renewable energy sector that represents 5 per cent of the global market by 2030. This would mean Australia's renewable energy industry would be responsible for:

- 150–200 GW of installed capacity (on a cumulative basis)
- \$US25-50 billion of investment each year
- Up to 500,000 jobs in Australia

## Australia is fighting for a place in the global race to renewable energy.

The global capacity of renewable energy reached 240 GW in 2007, up 15 per cent for the second year in succession, driven by new investment of over \$US70 billion.<sup>32</sup> The sector now employs at least 2.3 million people around the world.<sup>33</sup>

Renewable energy is set for further growth – driven by global investment projected to reach \$US450 billion per annum by 2012 (Figure 3).<sup>34</sup> The main growth in renewables has been shifting away from Europe and towards the US and China, where strong targets and incentives are attracting investment.<sup>35</sup>

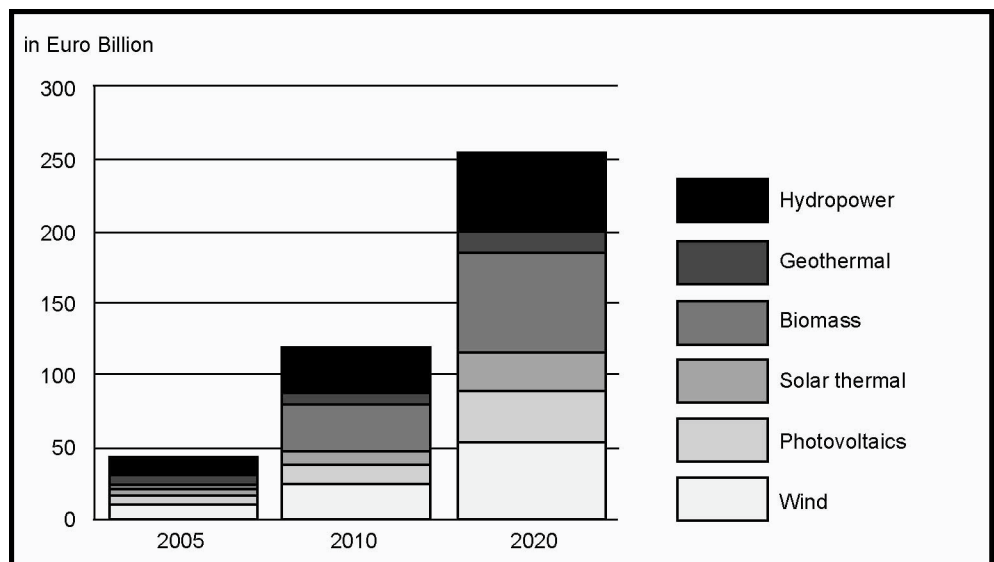
Australia's renewable energy capacity stood at about 1.7 GW in 2006,<sup>37</sup> or less than 1 per cent of global capacity. The sector provides around 15,000 direct and indirect jobs, has annual sales of nearly A\$2 billion and has an estimated A\$8 billion invested in electricity generation assets.<sup>38</sup>

Australia already has examples of world class re-

newable energy businesses and cutting edge research in energy storage – with demonstration projects in off-grid storage for overcoming intermittency issues from medium scale renewables such as wind and solar.

Based on current projections, even taking into ac-

Figure 3: Global market projections for renewable energy technologies<sup>36</sup>



count the Federal Government's proposed 20 per cent expanded national renewable energy target, Australia's share of the global renewable energy sector will at best remain flat, if not fall, as the world continues to ramp up investment.

Australia has numerous advantages in this critical sector. Wind capacity factors are 5-10 per cent

higher on average than in the EU, Australia has far more sunlight hours and more intense solar radiation and prospective geothermal resources are highly promising.

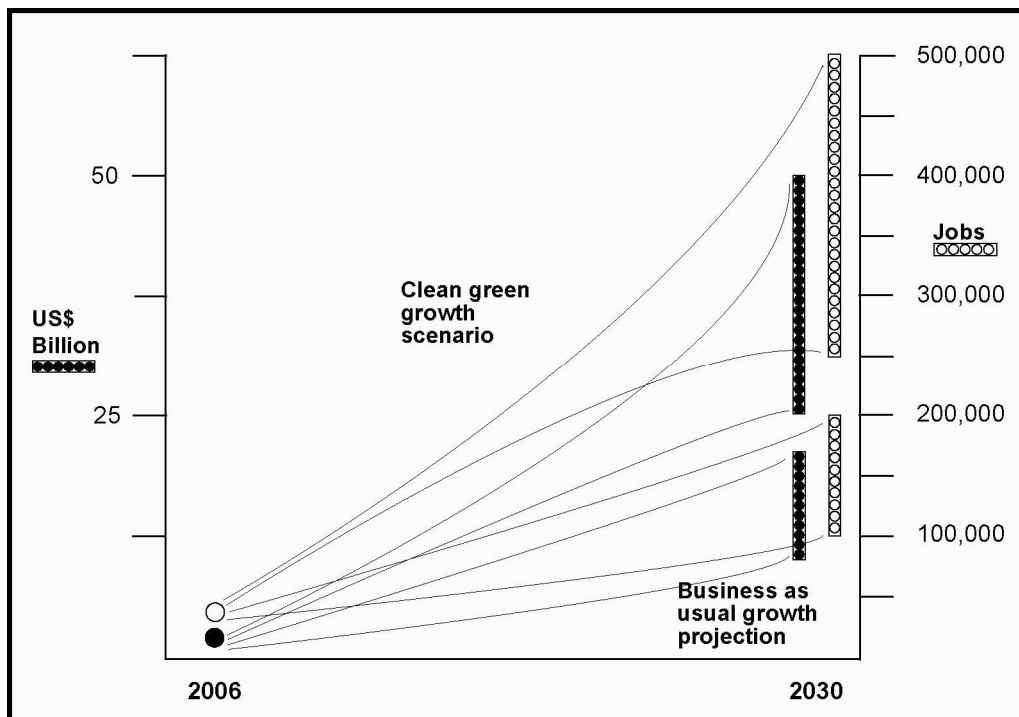
In addition, Australia benefits from advanced research in these areas and a set of highly ambitious, internationally-oriented renewables businesses.

However, there is a risk these companies will leave Australia (as others have before them) unless domestic demand remains strong and policy support consistent. Figure 4 shows the potential benefits of Australia taking strong steps now to secure a greater share of the global market, compared with business as usual.

**Key policy drivers:** The main policies needed to support the uptake of renewable energy is the establishment of the Carbon Pollution Reduction Scheme with a strong emissions reduction target, designed to deliver global stabilisation of CO<sub>2</sub>-e concentrations below 450ppm.

This could be supported by a suite of policies to pull technologies through the commercialisation process, starting with capital support for demonstration projects, a feed in tariff for least mature technologies, and a strong national renewable energy target of at least 25 per cent by 2020 for maturing technologies.

*Figure 4: Projections for Australia's renewable energy sector*



*Business as Usual* scenario assumes Australia maintains its place in the global market, as a result of the National Renewable Energy Target and other policy measures (representing about 2 per cent of the global market by 2030).

*Clean, green growth scenario* assumes Australia takes strong proactive steps now to secure a greater share of the global market, and reaches 5 per cent of the global market by 2030

Market figures refer to investment per year to install new capacity, and manage existing capacity

### **Case study: Pacific Hydro**

Pacific Hydro is an Australian-based developer and manager of renewable energy projects. Founded in 1992, it has developed a range of hydro and wind projects in Australia and overseas - including Brazil, Fiji, Chile and the Philippines.

Initially the company focused on hydro projects that made use of existing irrigation dams or run-of-water flows. In 2001, the company diversified into wind energy - the same year the government introduced the Mandatory Renewable Energy Target.

Pacific Hydro now has a market value of approximately \$2 billion and employs over 250 people across Australia and around the world. It has 1000 megawatts of wind projects, including the significant Challicum Hills Wind Farm and Portland Wind Project, and a strong project pipeline for the next five years.

In July 2005, Pacific Hydro was purchased by IFM Renewable Energy under the control of Australian industry super fund Industry Funds Services Pty Ltd. It has continued its ambitious agenda of using Australian project development and asset management skills to harness opportunities around the world.



*Challicum Hills wind farm, Victoria*

# ENERGY EFFICIENCY

**Energy efficiency technologies and services are those used to reduce energy use in residential and commercial buildings, appliances, and in industrial production systems. In this report they do not include transport systems.**

## **Target 2030**

Australia should create ambitious goals for instituting energy efficient measures domestically and capturing a significant part of the global market. The sector should aim for:

- Five per cent of the world market in energy efficiency by 2030, or \$US50 billion of additional market volume per year
- Creating an additional 75,000 jobs in Australia

## **Energy efficiency technologies and services have enormous potential to deliver low cost emissions reductions.**

Massive energy savings are essential across the full range of domestic and business activity in order to address climate change, provide energy security and reduce energy costs. Energy efficiency technologies and services will have an important role in achieving the required savings, provided the barriers to their uptake can be overcome.

World market volume in energy efficiency technologies is already in the region of \$US540 billion.<sup>39</sup> The majority of that is accounted for in measuring and control technology, household goods (white goods) and building services, heating and air conditioning technology.

Steady worldwide market growth of about 5 per cent is expected. By 2030, the additional market volume (not counting the transport sector) that can be directly attributed to increasing energy efficiency will amount to around \$US1 trillion.<sup>40</sup> Just under a third of this increase will be generated in non-OECD countries.

The impact on employment is expected to be strongly positive with job growth coming both directly from new business in energy efficiency and indirectly from productivity gains elsewhere. For example, calculations from scenarios commissioned in Germany show that an improvement in global

energy and material productivity of 20 per cent in 15 years will lead to a net rise in employment of 1 million.<sup>41</sup>

In general, Australia lags behind world's best practice in energy efficiency and currently has limited capacity in manufacturing related equipment and providing energy efficiency services. But supportive measures could transform the industry and its contribution to the Australian economy and the nation's climate change challenge. The sector could halt the increase in domestic energy use by 2012 and begin to reduce it thereafter. This would require efficiency improvements beyond business-as-usual levels of 1.5-2 per cent per annum.<sup>42</sup>

A 2004 study concluded the economic benefits of an energy efficiency target in Australia were estimated to range from \$2.4 billion to \$6.6 billion. By 2017, investment in installed capacity would be reduced by between 2,500 MW and 5,000 MW and collective greenhouse emission savings over the period 2004 to 2025, were approximately equal to or greater than national greenhouse gas emissions for 2004.<sup>43</sup>

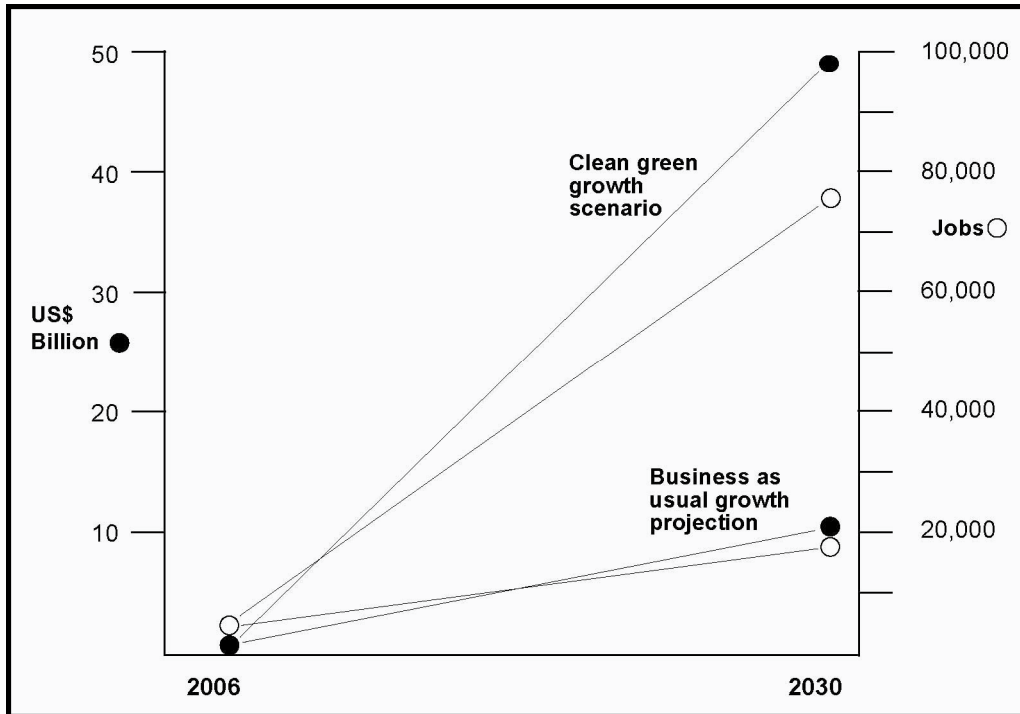
The benefits of strong proactive action to create a world leading Australian energy efficiency sector are shown on Figure 5, alongside projections for a 'business as usual' growth trajectory.

**Key policy drivers:** The main policies needed to support the uptake of energy efficiency are the establishment of the Carbon Pollution Reduction

Scheme with a strong emissions reduction target, designed to deliver global stabilisation of CO<sub>2</sub>-e concentrations below 450ppm, action to address information and cultural barriers, strengthening and expansion of Minimum Energy Performance Standards, mandatory energy efficiency ratings of buildings and an expansion of mandatory energy efficiency reporting.

A large-scale retrofitting program to improve energy efficiency of Australia's existing housing stock (for example, by tackling 5 per cent of existing housing per year) would provide a significant boost to the sector as well.

**Figure 5: Projections for Australia's energy efficiency sector**



*Business as Usual* scenario assumes Australia grows steadily to gradually represent about 1 per cent of the global market by 2030, through domestic action and opportunistic exports.

*Clean, green growth scenario* assumes Australia takes strong proactive steps now to build a world leading energy efficiency sector, which represents about 5 per cent of the global market by 2030, through strong action domestically and action to facilitate access to a greater share of the global market

Market figures refer to annual market volume

# SUSTAINABLE WATER SYSTEMS

**Sustainable water systems are those focused on efficiency improvements and alternative treatment technologies in urban and rural environments**

## **Target 2030**

Australia should aim to create a sustainable water sector that matches our potential, and represents up to 10 per cent of the global market by 2030. This would mean a water sector, operating at home and around the world, based on:

- \$US25 billion of export activity each year, of sustainable water technologies and services
- 66,000 jobs in Australian companies servicing this level of activity
- A domestic water sector focussed on maximising efficiencies and sustainability of water use across the economy

**Australia is well placed to help meet the world's growing needs for water through a focus on developing and managing sustainable water systems.**

The world faces an enormous task to provide water services to a growing and urbanising population in the context of looming water scarcity and inadequate or ageing infrastructure.

The world is experiencing a growing water deficit, with serious implications for food security, sanitation and other basic needs. We need 500 times more water to produce our food intake than to meet our drinking needs, so without ongoing access to water resources the world will face a mounting food shortage.<sup>44</sup>

The global market for water supply and services is currently about \$US300-400 billion<sup>45</sup>, with Asia making up about \$US120 billion.<sup>46</sup> Strong growth is projected over coming decades, driven by urbanisation, the need to invest in efficiency improvements, and the need to supply water for expanding agricultural production around the world. It is expected the world will invest some \$US23 trillion in water infrastructure by 2030, on a cumulative basis.<sup>47</sup>

Australia's water sector is currently valued at about \$18 billion, or 5 per cent of the global market, with

less than 20 per cent of activity directed at export markets. The industry employs about 125,000 people. The majority of this activity and jobs are directed at traditional water management and services, with less than 20 per cent focusing on sustainable water systems.

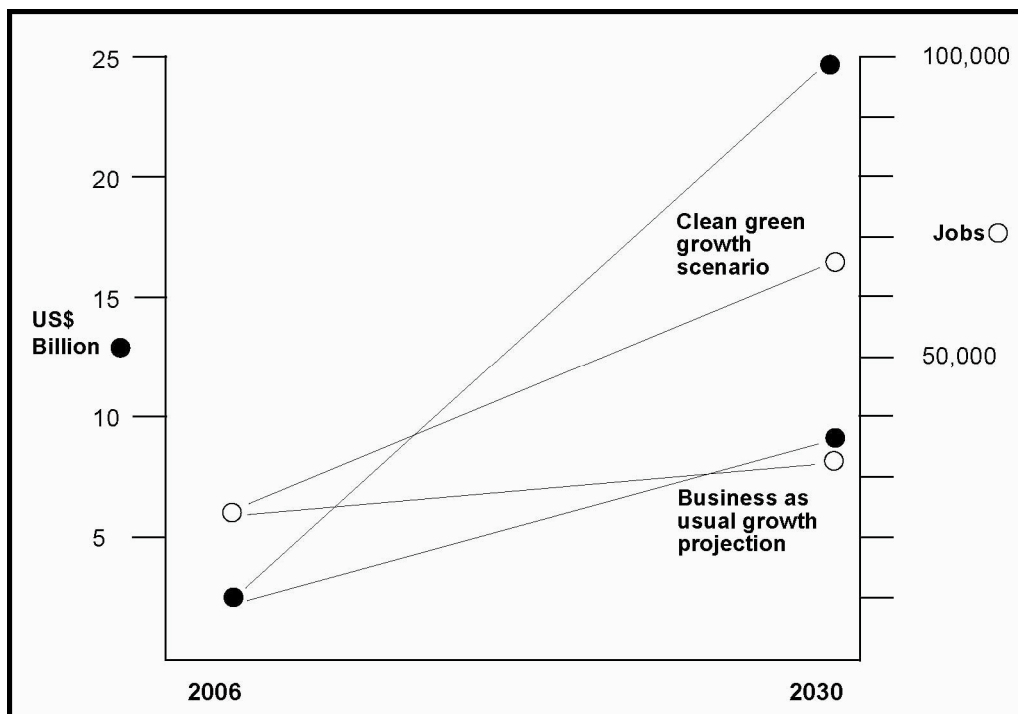
Australia has a strong track record of innovation in the water sector. Specifically, the nation boasts a strong R&D base, notable innovation in water use efficiency and treatment technologies, and recognised skills in asset management. From this there are a number of impressive stories of Australian water technology and services providers finding commercial success around the world.

The benefits of strong proactive action to create a world leading Australian sustainable water systems sector are shown on Figure 6, alongside projections for a 'business as usual' growth trajectory.

**Key policy drivers:** The main policies needed to support the uptake of sustainable water systems are to provide continuity in R&D, strengthen market signals including reforming urban water pricing and ramping up sustainable water standards for buildings and communities, ensuring adequate environmental flows for Australia's inland water systems, and increasing support for industry and scientific bodies dedicated to promoting exports of sustainable water systems.



**Figure 6: Projections for Australia's sustainable water sector**



*Business as Usual scenario* assumes Australia grows steadily, with a focus on the domestic market and gradually addressing water scarcity

*Clean, green growth scenario* assumes Australia takes strong proactive steps now to address water scarcity and to ensure these solutions are effectively exported to the region and beyond

*Market figures* refer to investment per year to install new capacity and manage existing capacity

### **Case study: AquaSpy**

AquaSpy designs, manufactures and distributes moisture sensors and smart information technology for the irrigation market around the world. Along with fellow Australian company Sentek, AquaSpy is recognised as a world leader in this specialised market.

The technology helps to ensure the right amount of water is delivered at the right time to agricultural and horticultural operations, and recreational facilities - in one instance reducing water use by 73 per cent, which translated to \$35,000 savings in water and energy costs per hectare per year, for a 2-3 month return on investment.

AquaSpy is firmly focussed on export markets. The majority of its team is based in Adelaide, but the vast majority of sales are in overseas markets. Companies like AquaSpy face particular challenges in commercialising new products in a water market that is not consistently driven to adopt water efficiencies AquaSpy has benefited from the Commonwealth Government's R&D tax concessions, and an Export Market Development Grant.

# BIOMATERIALS

Biomaterials are converted from renewable resources, such as starch, sugar, vegetable oils and cellulose, while there has been recent concerns that these can deflect from food production, there is huge potential from non-food crops and by-products from existing crops which could significantly increase agricultural productivity. These materials typically have product cycles with low greenhouse gas emissions, generating less waste, and using less energy and water.

## Target 2030

Australia should aim to create a vibrant sustainable materials sector by 2030 that matches our potential in the bioeconomy, based on:

Seven integrated biorefineries, each processing 1 million tonnes of biomass each year

- A \$US10 billion industry (\$US700 million of capital investment, an annual investment of \$US9.1 billion in biomass and an additional \$US100 million in other operating costs)
- 2,500 to 3,000 jobs in biorefineries

Bioplastics becoming the dominant form of plastics in the domestic market (representing over 80 per cent of the market):

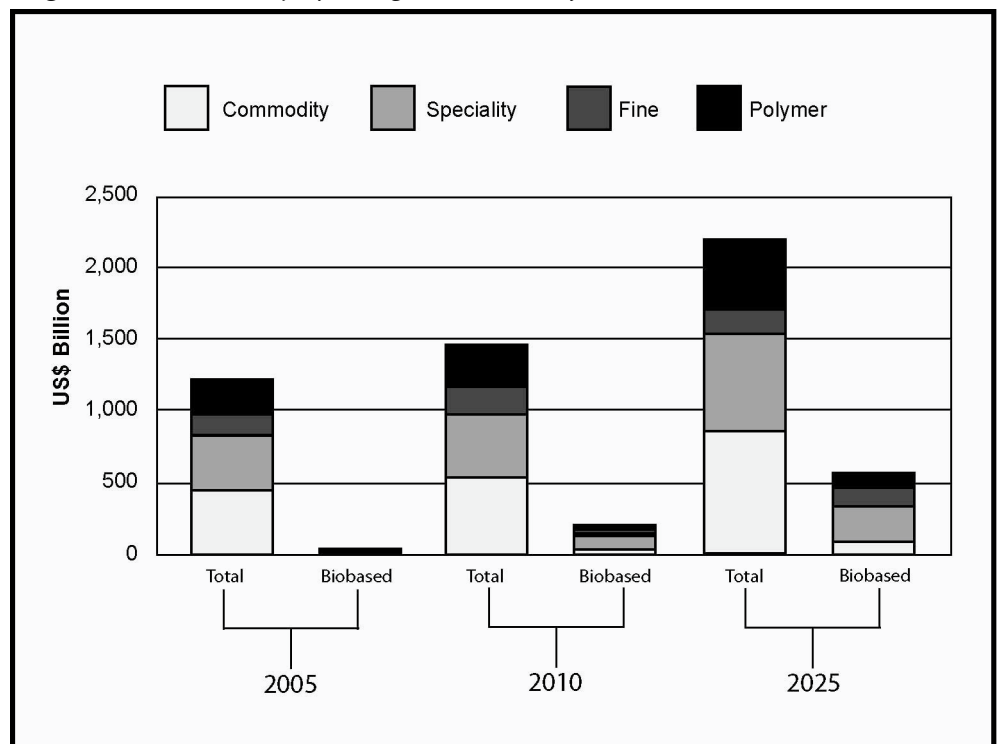
- Bioplastics manufacturing industry valued at US\$2.0 billion
- Employing some 33,000 people

## Materials from renewable sources will be the building blocks of products and packaging in the future.

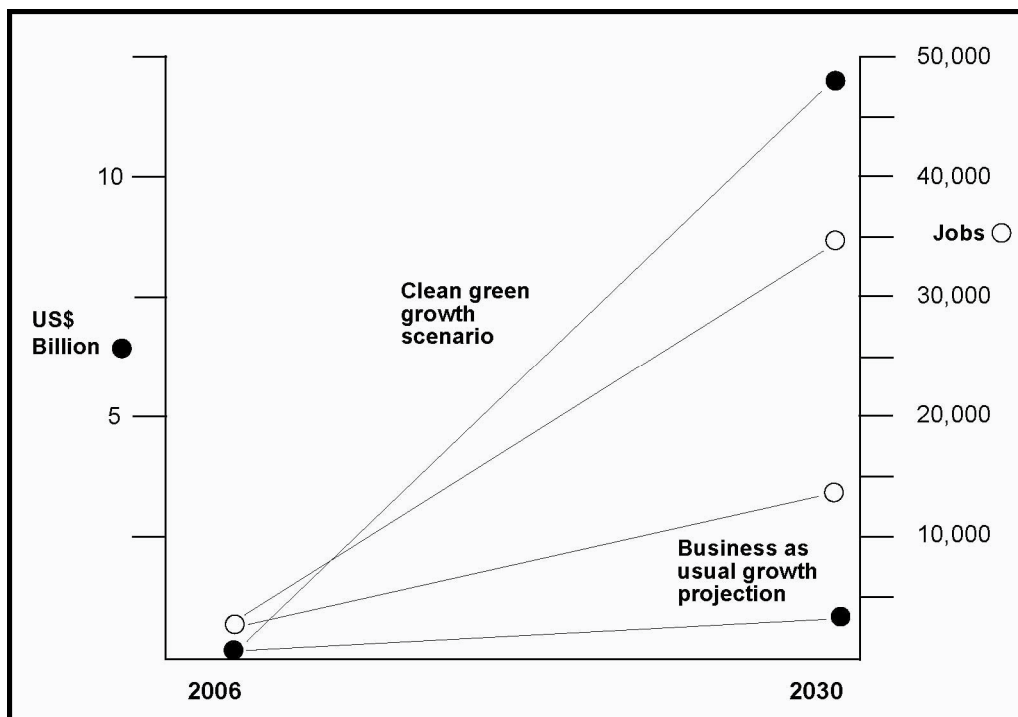
Biomaterials feed into the emerging bioeconomy, characterised by sustainable practices, new agribusiness opportunities, value added manufacturing, and eco-innovation.

Biomaterials include products as diverse as biodegradable packaging and plastics, bio-based chemicals, metallurgical and fossil fuel product substitutes, and many others. Sustainable bio-renewable products are produced in

Figure 7: Current and projected global markets of chemical sectors<sup>49</sup>



**Figure 8: Projections for Australia's biomaterials sector**



*Business as Usual* scenario assumes Australia grows steadily, with one biorefinery and bioplastics growing to represent one third of the market by 2030

*Clean, green growth scenario* assumes Australia takes strong proactive steps now to build a sustainable materials sector, with seven biorefineries and bioplastics representing 80 per cent of the market by 2030

*Market* figures refer to investment per year to install new capacity and manage existing capacity

closed-loop systems, with resources capable of being captured and reused and with minimal or no generation of harmful materials.

The current market for biomaterials is estimated at about \$US20 billion (in 2005), or about 2 per cent of the global chemistry industry. It is projected to grow strongly – to at least 10 per cent of the global chemical industry by 2010 (or \$US140 billion), and to \$US500 billion by 2025, or around one quarter of the global chemical industry (Figure 7).<sup>48</sup>

Australia has a fledgling biomaterials sector, spanning R&D, manufacturing and marketing of bio-

plastics. The current market value is about \$100 million, with about 200 direct jobs in the sector.

More importantly, Australia has considerable potential, including strong R&D capabilities in biotechnology research, efficient natural resource and agricultural production, a diversity of crops and feedstock, security of supply and economic, regulatory and political stability.

To harness this potential, Australia should set an ambitious goal of having a network of biorefineries<sup>50</sup> in regional Australia, based on production that complements rather than competes with food pro-

duction and environmental protection. Such industries could capitalise on domestic R&D in biotechnology and materials processing, value-adding to agricultural and biomass production, and exporting to the region and beyond. This will need strong support for the demonstration of biorefineries, support for the establishment of bioplastics manufacturing, and market mandates for bioplastics.

These outcomes would depend on Australia taking strong proactive steps to support the expansion of the biomaterials sector, as shown in Figure 8.

**Key policy drivers:** Policies to promote the commercialisation and uptake of biomaterials are as diverse as the range of biomaterials themselves. Important tools will include restrictions on waste disposal, improved product standards for packaging and other plastics uses, progressive limitations on the use of harmful substances in consumer goods and production processes, and strong government procurement policies.

### Case study: Plantic Technologies

Melbourne-based Plantic Technologies Limited is a testament to Australian innovation. Plantic holds 13 global patents on bioplastics, based on technology developed through the Commonwealth Government's Cooperative Research Centre program.

The proprietary technology delivers a biodegradable and water dispersible alternative to conventional plastics, derived from a specialised corn – a non-genetically modified hybrid. Multi-nationals such as Amcor, Cadbury Schweppes, DuPont, Marks & Spencer and Sainsbury's are customers or partners.

The company was established in 2001 and is growing rapidly - sales volume in the first six months of 2008 increased 52 per cent on the same period in 2007. Plantic has a workforce of approximately 50 people, with a production facility in Altona and a global presence in France, Germany, the UK and US.



*Bioplastics confectionary trays being made at Plantic Technologies' Mel-*

# GREEN BUILDINGS

Green buildings offer the highest levels of reduction in energy, emissions, materials and water use through design, construction and operational practices. They include new construction in the residential and commercial sectors, as well as to retrofitting and renovating the existing stock.

## Target 2030

Australia could take strong proactive steps now to create a world leading green building sector that by 2030 is responsible for:

- Rapidly accelerating the rate of green building activity in Australia
- Capturing at least 10 per cent of green building activity in Asia
- Capturing at least 2 per cent of green building activity in the US and Europe

This would create a green building sector in 2030 that is valued at over US\$80 billion supported by over 230,000 jobs in Australia.

**Buildings are a critical area for climate change mitigation and sustainable development. Their large environmental footprint means they offer the opportunity for significant, low-cost, reductions in carbon emissions and resource use.**

Buildings are responsible for about 40 per cent of global primary energy use, greenhouse gas emissions, and waste generation; 32 per cent of the world's resources in construction; and the consumption of about 12 per cent of global water.<sup>51</sup>

The Intergovernmental Panel on Climate Change identified the capacity to reduce projected emissions from buildings by 29 per cent percent by 2020; the single largest potential of any sector.<sup>52</sup>

The world is responding through a shift to green building. In Australia, the number of building projects registered under the voluntary Green Star program has grown from 50 in 2006, to 270 last year and to 680 in 2008.<sup>53</sup> In the US the numbers of registered projects under the LEED program have seen similar growth – from 700 in 2006, to 1250 last year and 1540 (projected) for 2008.<sup>54</sup>

This response needs to be urgent; construction occurring today will determine in part energy and water use patterns for decades to come. Australia is set to invest AUD\$158 billion in new construction

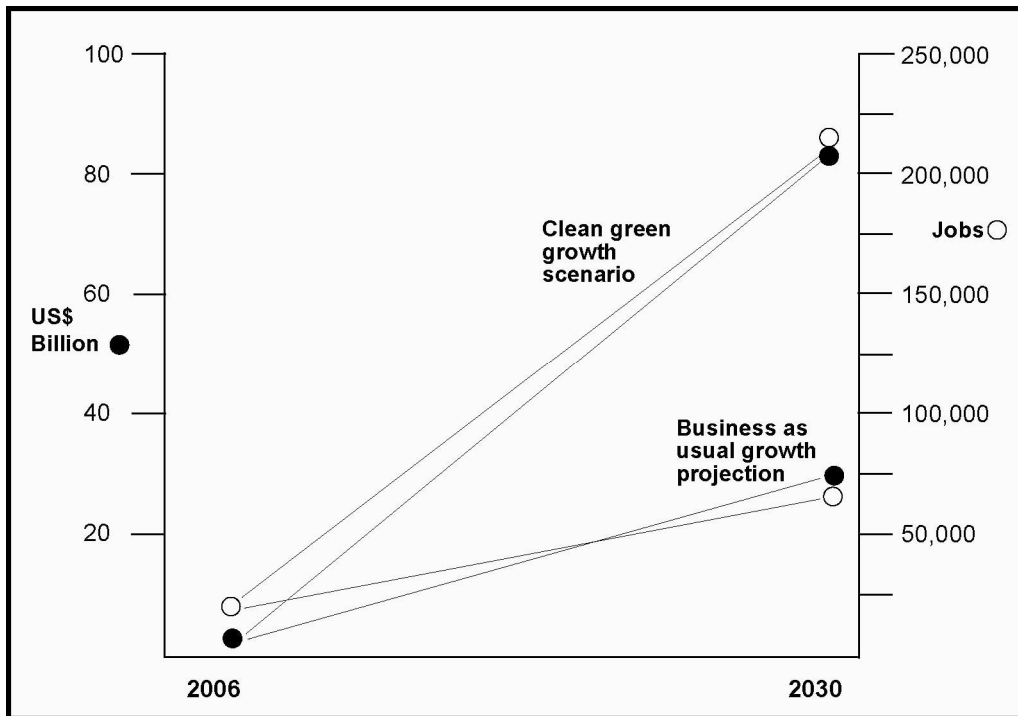
during 2008, driven by demographic shifts to larger, lower occupancy houses.<sup>55</sup> Over half of the world's new buildings will be in China over the period to 2030.<sup>56</sup> Global steel industry magnate Lakshmi Mittal believes China will need between 40,000 and 50,000 new skyscrapers by 2025 to meet its urbanisation needs.<sup>57</sup>

This would create a green building sector in 2030 that is valued at over \$US80 billion supported by over 230,000 jobs in Australia. The opportunities for Australia from taking strong proactive action are shown on Figure 9, alongside projections for a 'business as usual' growth trajectory.

**Key policy drivers:** The main policies needed to support this widespread shift to green building are support for demonstrating new innovations, reform of the building code, launching an ambitious program to retrofit Australia's housing stock, differentiation of green buildings in the planning and approvals process, and an active program of in-bound and out-bound trade missions.

Australia should set world's best practice standards and codes for all new and retrofitted buildings, including ambitious standards in building materials, energy and water standards.

**Figure 9: Projections for Australia's green buildings sector**



*Business as Usual* scenario assumes Australia's green building sector grows steadily, at about the average global growth rate of 5 per cent pa, but fails to capitalise on the opportunities to deliver more sustainable cities.

*Clean, green growth scenario* assumes Australia takes strong proactive steps now to create a world leading green building sector, with growth doubling the average annual growth rate through to 2030, and the green building sector establishing a strong presence in Asia and a niche presence in the EU and US



# WASTE AND RECYCLING

## Target 2030

Australia could aim high; we should take strong proactive steps now to build a world leading recycling sector. By 2030, this would mean a recycling sector, at home and around the region, responsible for about:

- \$US37 billion of activity
- 50,000 jobs (14,000 direct jobs and 36,000 indirect jobs)

**The Australian waste and recycling industry is well positioned for global growth, with some companies already having established a firm presence in global markets.**

The manufacture and consumption of goods under current production models entails the ever-increasing use of raw materials and energy and the generation of mountains of waste. This upward spiral is unsustainable.

Sustainable patterns of consumption and production offer a much needed alternative development model.

Extended producer responsibility, where manufacturers are responsible for goods through their full life-cycle from production to end-of-life disposal, is a model that governments are starting to use to address unsustainable consumption.

European manufacturers now have responsibility for electrical and electronic equipment and for cars at the end of the use phase of their life.

The central challenge here is two-fold: goods need to be designed in ways that enable end-of-life reuse; and recycling systems are needed to efficiently collect and re-process used goods and to find markets for their further use.

Without good recycling systems and viable markets for further use, governments are reluctant to force manufacturers to modify product design.

This creates an enormous opportunity for the recycling industry. Recycling plays a central role in im-

proving waste management by: reducing waste going to landfill; reducing consumption of natural resources; and improving energy use.

Estimates for the global market for recycling suggest it could be as high as \$US500 billion, and job figures from around the world suggest there could be well over 10 million people employed in recycling around the world.<sup>58</sup>

The Australian recycling industry is valued at about \$12-15 billion, and employs almost 11,000 people directly and another 27,000 indirectly.<sup>59</sup>

Australian companies already compete strongly for waste and recycling contracts around the world, setting a platform for further industry growth.

The market for secondary raw materials is expected to continue growing, as will the market for recycling technology, as today's waste is increasingly seen as "the mine of the future".<sup>60</sup>

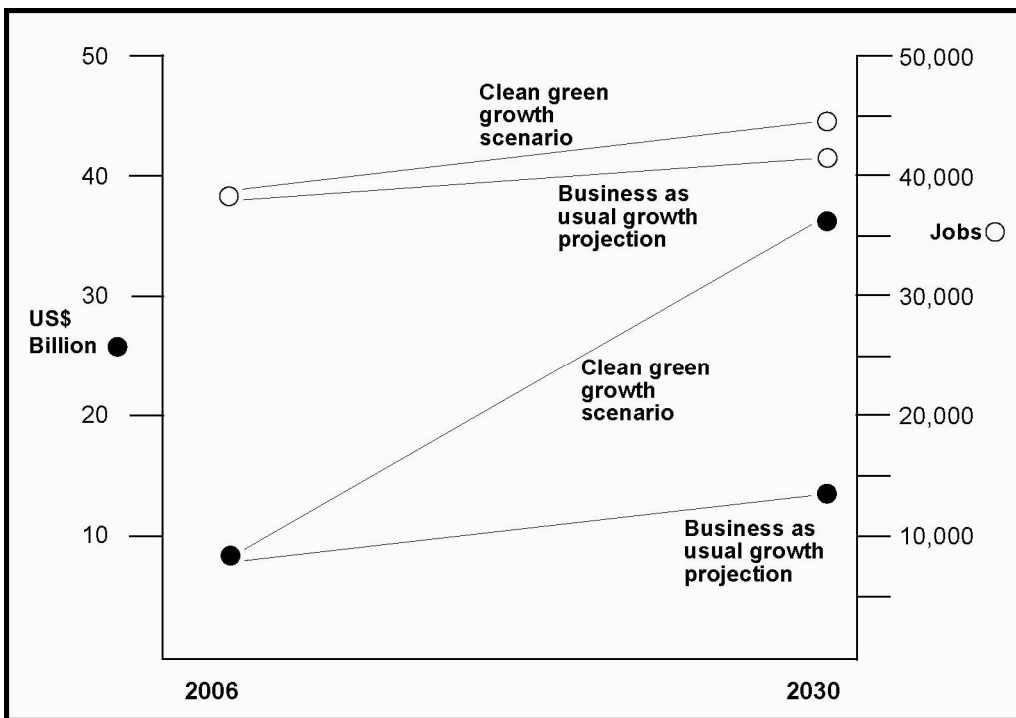
Set clear timelines for eliminating categories of waste to landfill, starting with green waste, e-waste, PET plastics and paper. Accelerate the development of extended producer responsibility standards for key products.

The opportunities for Australia from taking strong proactive action are shown on Figure 10.

**Key policy drivers:** There are numerous potential policies to increase reuse, remanufacturing, and recycling. Inclusion of landfill in the Carbon Pollution Reduction Scheme will increase prices on waste and make recycling more attractive. Progress-

sively phasing-out categories of waste to landfill would make recycling even more attractive. Product design standards that encourage reusability and recyclability and extended producer responsibility schemes should be pursued with much greater resolve.

**Figure 10: Projections for Australia's waste and recycling sector**



*Business as Usual* scenario assumes Australia fails to capitalise on growth in the global market, beyond a few globally focussed companies. Growth is assumed to be about two thirds of the global rate through to 2030.

*Clean, green growth scenario* assumes Australia takes strong proactive steps now to build a world leading recycling sector, with growth rates tripling the average annual growth rate through to 2030.

## ENDNOTES

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