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Skilling up for a low carbon future

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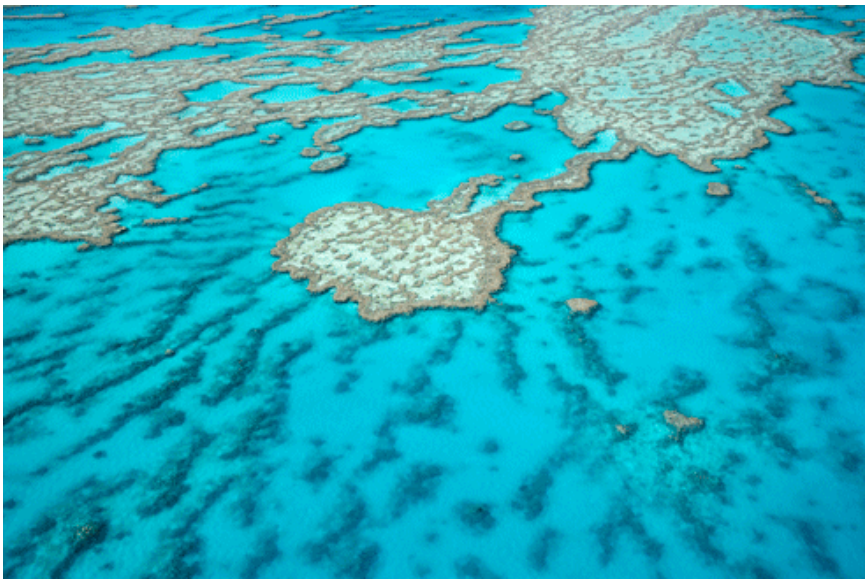
A lack of appropriate skills and qualifications in the professions over the next decade may see Australian businesses forego significant opportunities in the global shift to sustainable development. What is the extent of the broader capacity building challenge facing our education sector, and how quickly will we need to respond?



Credit: iStockphoto

In Australia, as hundreds of millions of federal dollars are poured into training and education to fill skills gaps across areas such as mining, construction and IT, demand for sustainable products and services is also growing across many sectors, often outstripping supply.

For example, the federal commitment to reducing Australia's greenhouse gas emissions by 60 per cent from 2000 levels by 2050 has triggered a raft of measures, from home household insulation, solar energy and solar hot water initiatives through to green loans, wind farms, industrial energy efficiency initiatives and carbon auditing and reporting, to name a few.

As forecast in a 2008 report by CSIRO to the Dusseldorf Skills Forum,[1] transitioning to a low-carbon sustainable economy will require a massive mobilisation of skills and training for 3 million workers employed in jobs that affect our environmental footprint.

Mixed results from the rollout of the recent programs mentioned above highlight the need for significant capacity building from planning through to implementation.

The greenhouse gas mitigation challenge exemplifies the complex nature of capacity building. As shown in the graph, stabilising greenhouse gas emissions by the end of this century (in this example, to 550 ppm of carbon dioxide equivalent), could involve many options. All involve stopping the increase in tons of greenhouse gasses emitted – or peaking – in the short-term, then consistently reducing – or tailing – the amount of emissions to reach the desired

long-term target. Furthermore, earlier and lower peaking strategies can result in reduced longer term tailing costs, but require more upfront commitment and action.

Such peaking and tailing scenarios can involve different short and long-term strategies. For example, under the shorter term peaking scenario, capacity building needs to focus on identifying the knowledge and skills required to respond to energy efficiency opportunities, such as undertaking energy efficiency audits, installing solar hot water and energy systems, and understanding the energy performance and retrofitting opportunities for domestic appliances and industry equipment. Implementation might involve 'just-in-time' style postgraduate education such as certificates, diplomas and masters programs, alongside professional development seminars and short courses.

In the longer term, a sustained reduction in greenhouse gas emissions will involve further energy efficiency improvements, as well as a large scale transition to low-emissions energy sources, such as solar, wind, geothermal and tidal power. This would require capacity building at the undergraduate level, with a focus on areas such as whole-system design, resource productivity and transformational improvements. It is worth noting that such a transition also needs to begin immediately, as the pool of qualified graduates needs to be ready to fill senior decision making positions in 15–20 years.

Capacity building will also be critical in conserving Australia's biodiversity and protecting environmental 'hotspots' – such as the Murray–Darling Basin, the Great Barrier Reef and South East Queensland.

Credit: iStockphoto

Murray–Darling Basin

Spread over 4 states and with 85 per cent of its land used for agriculture (including rice, oranges, pigs, apples and wheat), the Murray–Darling Basin contributes around 40 per cent of the total value of Australia's agricultural commodities.

However, the region is in rapid decline due to over-allocation of water resources, salinity and reduced runoff. Water use from the Basin has increased 5-fold in less than a century, resulting in degraded land in most of the Basin's valleys.[2] The Basin is also under pressure from introduced species, recreational and commercial fishing, diseases and parasites that attack native fish, and declining water quality.

Addressing these issues requires the diverse users of the Basin's resources – mainly farmers, industry and government at all levels – to rapidly learn, educate and otherwise share key information with each other on issues such as covering open channels, greywater reuse, large scale rainwater harvesting, soil improvements, crop modification and irrigation innovations.

As climate change effects intensify, pressure on the system may increase, with changes in rainfall and temperature patterns likely to further impact river flows and ecosystem health.[3]

Future practitioners and decision-makers – in areas such as aquaculture, farming, fisheries, tourism, residential and commercial development, water and wastewater treatment – will need a 'whole systems', interdisciplinary

understanding of the Basin to identify opportunities for ecosystem restoration and ensure the Basin's continued contribution to the national economy.

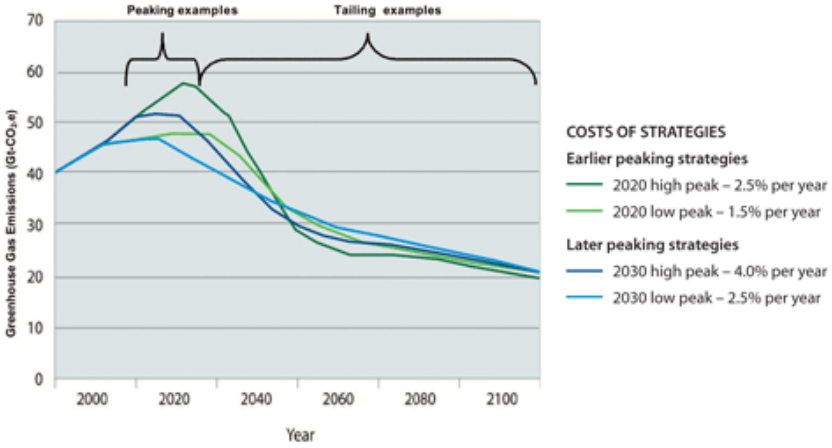
Priorities will likely include restoration of river health and biodiversity in the Basin's three major tributaries, salt intrusion management, and a shift to low-pesticide, low-herbicide, more sustainable agricultural practices.

Great Barrier Reef

The immediate environmental challenges facing the Great Barrier Reef are coral dieback and algae outbreaks from polluted catchment runoff and warmer ocean temperatures due to climate change, and longer term loss of species and habitat from urban development, fishing and poaching.

Building capacity for short-term management of this ecosystem should ensure that existing urban development and agricultural practices do not further impact upon reef health, through effective catchment management and pollution control.

Over the longer term, reef managers and communities will need to maintain or improve reef resilience to fluctuations in ocean temperature and acidity. This will require capacity building across disciplines such as engineering and town planning, and will also involve large-scale collaborative action across the fisheries, tourism, border security and agricultural sectors, for Australia to continue benefiting economically from a healthy reef.



Credit: Adapted from Stern.[4] Note: all four strategies will result in an atmospheric CO_2e of 550 ppm.

South East Queensland

As Australia's fastest growing metropolitan region, South East Queensland's population is predicted to expand over the next two decades from 2.8 to 4.4 million. At the same time, the region needs to manage current water and energy supply issues stemming from recent droughts, and develop longer term infrastructure solutions. The time lag associated with infrastructure development for transport, water and energy are such that the region needs to begin addressing these issues as soon as possible.

For example, a recent report into Queensland's transport systems found that by 2020, Brisbane's congestion woes will cost the city around $3 billion per annum, with congestion doubling or even tripling by 2055.

Managing this growth effectively requires new thinking and new skills to ensure that the population and economic growth are properly 'decoupled' from traditionally correlated trends, such as increased congestion, and water and energy shortages. Significant capacity building is required within built environment professions and associated trades in the short-term, to help construction and trade industries retrofit and build new infrastructure that is water, energy and materials efficient.

In the longer term, climate change may lead to rising sea levels, storm surges and flooding over the next several decades. The region will need the capacity to cost effectively supply and maintain buildings, transportation systems, food security, water and energy supplies, health services and waste management that are resilient to such change.

These three examples highlight how short and long-term strategies will require different capacity building responses. The message is that, to achieve sustainable development in the decades to come, Australia as a nation must begin building the capacity now to create a pool of future professionals and decision makers who can help us build a low carbon economy where pollution levels continue to fall while the population's well-being is maintained or improved.

From individual innovation to education

Peter Andrews

Peter Andrews has developed widely acclaimed farming practices that can help to reduce agricultural greenhouse gas emissions, combat the impacts of climate change, and return life and productivity to degraded land.

Over the last decade, his work has been viewed by senior officials, professors and others from around the world keen to learn how agricultural land can be restored using Andrews' 'natural sequence farming' method.

Degraded land on Andrews' Tarwyn Park property at Bylong NSW, and on another NSW property – 'Baramul' stud in Widden Valley, owned by consumer goods' magnate, Gerry Harvey – has been transformed into lush green pastures, soils teeming with life and running waterways.

After 30 years of struggling against scepticism in local, state and federal government, business, financial and legal sectors, and the scientific and academic community, Andrews' methods are finally being taken seriously. Scientists from several Australian universities have recently completed a Restoring Hydrological Connectivity project that has built on the scientific and technical understanding behind Peter's methods.[5] Professor Richard Bush of Southern Cross University, the lead scientist on the project, says 'This project was unique in the range of opportunities it offered for teaching, including specific opportunities for PhD students, involvement of honours students, and site visits by undergraduates. It allowed valuable interaction between students and a broad range of stakeholders including landholders, people involved in landcare and policy makers. The students were therefore better equipped to understand and describe the relevance of their research.'

Ken Bellamy

Ken Bellamy has spent the last decade working to restore land productivity, protect the Great Barrier Reef, capture carbon dioxide, treat wastewater and reduce landfill through highly efficient composting – in particular, what he calls a 'breakthrough' in understanding microbial activity. [6]

Ken's company, Vital Resource Management, based in Townsville, Queensland, supplies the Queensland sugar industry with microbial solutions for benign wastewater treatment. According to Ken, the key to his innovation is the principle of out-competing microorganisms rather than killing them to keep systems healthy.

'There are some very exciting future opportunities in benign and low energy solutions for waste water, agriculture, and in cleaning

services,' Ken says. The NSW Department of Climate Change and Water has commissioned scientists from the Australian National University his findings.

'I look forward to seeing how education materials can be created around this discovery, from primary schools through to universities,' says Ken. 'We just can't afford not to build this capacity in taking care of our soils and waterways – now and in the coming decades.'

Amory Lovins

Amory Lovins has been working on sustainable energy strategies for the US and other countries for more than four decades. He has developed the 'hypercar' concept that could revolutionise private car use, and co-authored landmark sustainability books, including *Factor 4* and *Natural Capitalism*.

When we at The Natural Edge Project (TNEP) knocked on the door of Lovins' Rocky Mountain Institute in Snowmass, Colorado, in 2003, we were uncertain about how to start creating education materials on sustainability, and asked him where to begin. Amory pulled out a proposal from his bottom drawer, saying, 'The best thing you can do is contribute to the non-violent overthrow of bad engineering!'

This was the genesis of *Whole System Design* – a sustainable engineering textbook published by The Natural Edge Project in 2008, and supported by the Australian federal government, the World Federation of Engineering Organisations, and UNESCO.

The authors are from The Natural Edge Project (TNEP), an Australian 'engineering for sustainability' working group, hosted by Griffith University and collaborating with other universities in Australia and internationally. This is the first of three articles from TNEP exploring the capacity building challenges facing our education sector.

1 Hatfield-Dodds, S., Turner, G., Schandl, H., and Doss, T. (2008). *Growing the green collar economy: skills and labour challenges in reducing our greenhouse emissions and national environmental footprint* . Report to the Dusseldorp Skills Forum, June 2008. Canberra: CSIRO Sustainable Ecosystems.

2 Department of the Environment, Water, Heritage and the Arts (2010) *Restoring the Balance in the Murray–Darling Basin, Water for the Future,* Australian Government.

3 Jones R. N., Whetton P. H., Walsh K. J. E. & Page C. M. (2002*) Future Impacts of Climate Variability, Climate Change and Landuse Change on Water Resources in the Murray–Darling Basin: Overview and Draft Program of Research*, Canberra, ACT: Murray–Darling Basin Commission CSIRO Division of Atmospheric Research, Aspendale, Victoria

4 Stern, N. (2006) *The Stern Review: The Economics of Climate Change*, Cambridge University Press, Cambridge.

5 *Restoring hydrological connectivity of surface and ground waters: Biogeochemical processes and environmental benefits for river landscapes*, summary final report for LP0455080 ARC Linkage Project, http://tinyurl.com/32n9nwf.

6 Hickson, K. (2010) 'Profile: Ken Bellamy', ABC Carbon, http://abccarbon.com/profile-ken-bellamy/.

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