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Cover image: Searcy Bay osprey.
Credit: Grant Hobson

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Making the connections

Appropriately, this issue covers more ground on climate change and mitigation measures. Our switch of government comes in parallel with confirmation of accelerating climate change effects (see page 4) and, significantly, the fourth meeting of the IPCC Kyoto framework nations in Bali, at which a new urgency for immediate and coordinated emissions reduction was to be committedly addressed.

On page 15, Ian Dunlop reflects on what he calls the 'short-termism' of environmental policy vision and campaigns during the recent election run-up, and refers to international pace-setting in encouraging deeper thinking and longer-term prioritising of environmental planning from the new government. Commitments in the next year will likely shape the crucial decade ahead, and there are outstanding opportunities for both historic leadership and economic reward in the mix.

In part two of our series on Australia's energy future, Mike Smith and Karlson Hargroves discuss the fundamental role that more responsive electricity demand management could play in both reducing national emissions and allowing renewable energy options to play their part in national strategy. The great news is that such initiatives are practicable measures with an immediate impact.

With money pouring into the burgeoning carbon offsets market, pages 12–14 review the arguments for and against different offset types, discussing the new certification standards being applied to what has been a rather wild new frontier, open to liberties and lacking guarantees.

The provision of the $50 million National Environmental Stewardship

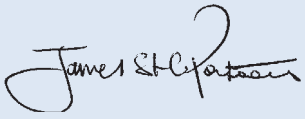


Programme by the federal government last year acknowledged the responsibility that private landholders must be supported to take in biodiversity conservation across Australia. It was a watershed in conservation initiative, helping to provide the means by which the vulnerable habitat remnants scattered across our states can be protected, managed and potentially connected up to form vital corridors for biodiversity exchange.

As climate change kicks in, these linkages with reserves and national parks will form vital refuge buffers for native plants and animals. James Woodford (page 25) reviews how the land stewardship program works and discusses why private landholders are a crucial part of the new habitat corridors being developed on each side of the country.

Finally, my thanks go to Mary-Lou Considine who did an outstanding job producing *Ecos* over the last two issues during my absence in Asia on post-tsunami work. Pages 8–11 begin a series of articles over the next six months on tsunami relief operations I visited in Sri Lanka and Thailand.

Enjoy your reading.



James Porteous
Managing Editor

Our planned Murray–Darling Focus has been postponed due to political sensitivities.



CSIRO

Next, in issue 141

Following the theme of private landholder participation in environmental management, the February–March issue discusses new 'carbon farming' initiatives being trialled around Australia to take advantage of the huge potential sequestration role that our pastures can play.



Recent extensive melting of ice in the Arctic highlighted shortcomings in current climate change models. George Burba

Shrinking timeframe to prevent dangerous climate change?

A growing number of scientists are echoing the concern raised in the latest Intergovernmental Panel on Climate Change (IPCC)'s Fourth Assessment Synthesis Report that climate change is happening faster than at rates predicted by earlier IPCC reports.

A recent paper published in the US Proceedings of the National Academy of Science (PNAS)[1] suggests that the Earth's land and oceans are losing their capacity to absorb the excess carbon dioxide from anthropogenic emissions, accelerating the build-up of greenhouse gases in the atmosphere.

The lead author of the PNAS paper, CSIRO's Dr Pep Canadell – Executive Director of the Global Carbon Project (GCP)[2] – says the acceleration in climate change is due to global economic growth, a more 'carbon-intensive' economy, and a reduced capacity of the land and oceans to absorb carbon from the atmosphere.

'Fifty years ago, for every tonne of CO_2 emitted, 600 kg were removed by land and ocean sinks. However, in 2006, only 550 kg were removed per tonne and that amount is falling,' Dr Canadell said.

In another PNAS paper published earlier this year,[3] a team of experts led by Dr Mike Raupach – also from CSIRO – concluded that the growth rate of global CO_2 emissions has risen from 1.1 per cent per year in the 1990s to over 3 per cent per year from 2000 onwards.

Dr Raupach said atmospheric carbon from fossil fuel emissions rose by 1.9 billion tonnes of carbon per year in the 11-year period 1995–2006, increasing from 6.5 billion tonnes per year in 1995 to 8.4 billion tonnes per year in 2006. (Additional carbon emissions from changes in land use remained constant over that period at 1.5 billion tonnes per year.)

'No region in the world is decarbonising its energy supply,' he commented.

The GCP team's findings add to the growing body of evidence that carbon dioxide concentrations, global temperatures and sea-level rise are, according to Dr Raupach, 'all near the high end of IPCC projections'.

Dr Raupach points out that while our climate system is complex, some basic interactions are well understood, such as the effects of greenhouse gases in the atmosphere. However, uncertainty levels rise dramatically when feedback loops – for example, carbon sinks losing their capacity to absorb CO_2 as global emissions increase – are introduced into climate models. Because many of these feedbacks are absent from current climate models, the IPCC has skewed its estimates towards the conservative.

'Observations from the last 10 years or so show that IPCC predictions are conservative not aggressive,' Dr Raupach says.

'The predictions made using models 10 years ago can now be compared with the reality. This comparison shows that while models are working well, if anything they are too conservative.

'But this should not be used as a reason for inaction. We don't need to worry whether the safe stabilisation level is 550 or 500 ppm of CO_2 equivalent in the atmosphere, but we do know it should *not* be 700 ppm.'

The widely reported shrinkage of the Arctic ice sheet during the 2007 northern summer – when the minimum area of sea ice was 22 per cent less than the previous minimum recorded in 2005 – was not predicted by any of the IPCC models.

This led some scientists – including NASA's James Hansen – to pronounce that the Earth may have reached a critical climate change 'tipping point' beyond which the melting of the poles is irreversible.[4]

Dr Raupach says while the extent of ice loss in the Arctic came as a shock to most scientists, 'at least we know now that the assumptions we made about the processes governing the Arctic ice melt are wrong'.

'We were not looking enough at difficult feedbacks: ice-sheet melting is a non-linear process and difficult to model.

'Even though there is uncertainty about how fast climate change will happen, we can be confident that it will happen, at least according to the IPCC predictions,' Dr Raupach reiterated.

'On the research side now, it's a matter of working out probabilities for climate change outlooks, which are bad at best and catastrophic at worst.

'But you don't need to wait for the uncertainties to be quantified to know what to do next – the need for emissions reductions is urgent.'

● **Mary-Lou Considine**

1 Canadell JG *et al.* (2007). Contributions to accelerating atmospheric CO_2 growth from economic activity, carbon intensity, and efficiency of natural sinks. PNAS 2007: 0702737104v1-0. Search at www.pnas.org
2 The Global Carbon Project, www.globalcarbonproject.org
3 Raupach MR *et al.* (2007). Global and regional drivers of accelerating CO_2 emissions. PNAS 2007 104: 10288–10293. Search at www.pnas.org
4 Spratt D (2007). The big melt: lessons from the Arctic summer of 2007. Report by CarbonEquity, www.carbonequity.info

Regional initiatives to protect coral reefs

After this year's APEC meeting in Sydney, Indonesian Prime Minister Susilo Bambang Yudhoyono announced Pacific Rim endorsement of an initiative to protect the 600 million hectare Coral Triangle. The six Asia-Pacific countries bordering the zone are involved.

The Coral Triangle – spanning eastern Indonesia, the Philippines, Timor Leste, the Solomon Islands, Papua New Guinea and parts of Malaysia – is regarded as the world's richest area of marine biodiversity, with 75 per cent of all known coral species and around 3000 species of fish.

However, with the region also being home to 120 million people, most of whom depend on fishing for their livelihood, pollution and overfishing are a serious threat to its coral reefs.

Rili Djohani, Director of the Indonesia Program at the Nature Conservancy – a leading global NGO – says the initiative's goal is not only to maintain the area's unique biodiversity but also to ensure sustainable use of its resources far into the future.

Scientists estimate the Coral Triangle is home to 500–600 coral species, 1600 reef fish species and almost every invertebrate marine group. In contrast, the coral reefs of the Caribbean have about one-ninth of the number of coral and reef fish species.

Closer to home, the Australian Research Council Centre of Excellence for Coral Reef Studies recently published a 'Consensus declaration on coral reef futures' endorsed by more than 50 scientists. The scientists unanimously called on all societies and governments to 'immediately and substantially reduce greenhouse gas emissions'.

Professor Terry Hughes, Director of the ARC Centre of Excellence for Coral Reef Studies, said the world has a 'narrow window of opportunity' to save coral reefs from the destruction caused by extreme climate change.



Coral reefs in the Asia-Pacific region are under threat from pollution, overfishing and climate change. ARC Centre of Excellence for Coral Reef Studies/Joshua Cinner

'Local action can help to rebuild the resilience of reefs, and promote their recovery. It is critically important to prevent the replacement of corals by algal blooms, by reducing runoff from land and by protecting stocks of herbivorous fishes,' he said.

Deputy Director of the ARC Centre, Professor Ove Hoegh-Guldberg from the University of Queensland, said reefs 'cannot be climate-proofed except via reduced emissions of greenhouse gases'.

'Without targeted reductions, the ongoing damage to coral reefs from global warming will accelerate and soon be irreversible.'

Both Hughes and Hoegh-Guldberg are contributing authors to the Intergovernmental Panel on Climate Change (IPCC).

Fund to save forests for carbon sequestration

The World Bank has announced it will set up a new fund to subsidise developing countries to protect and replant tropical forests for carbon sequestration.

The Forest Carbon Partnership Facility (FCPF) is on the agenda for the United Nations Framework Convention on Climate Change being held in Bali in December, where representatives of 180 countries are shaping a global agreement to succeed the Kyoto Protocol after its expiry in 2012.

The facility has attracted interest from a number of developing countries including Indonesia, Brazil and several in Africa's Congo River basin.

Deforestation accounts for 20 per cent of total global greenhouse gas emissions – more than all the world's cars, trucks, trains and airplanes combined.

The World Bank says that creating economic value for tropical forests will help developing countries generate revenue for poverty alleviation while conserving natural resources such as fresh water, food and medicines that the forests provide local populations.



Under the World Bank scheme, developing countries will be funded to protect their tropical rainforests such as this one in Papua New Guinea. ensis

'It will involve a lot of work on the ground with countries to establish both a physical and institutional infrastructure to demonstrate that they actually avoid deforestation,' said the manager of the World Bank's carbon finance unit, Joelle Chassard.

Participating countries will need to determine the present state of their forests in order to measure future deforestation rates. They will also have to establish the carbon content of forests with different trees and different sequestration rates.

The US$300 million fund will initially be used to finance emission reductions and help prepare countries with the necessary tools to monitor the forests.

New standard and big investment for wind energy

The Clean Energy Council has launched the world's first wind farm accreditation system, Certified Wind Farms Australia (CWFA), which should ensure that future wind farm developments not only conform to best practice, but also include effective community consultation.

The independently audited scheme is based on Auswind best practice guidelines and the international environmental standard ISO 14001.

Dominique La Fontaine, CEO of the Clean Energy Council – the industry body formed through the merger of Auswind (Australian Wind Energy Association) and the BCSE (Australian Business Council for Sustainable Energy) – says the CWFA demonstrates the council's commitment to 'transparent community consultation and maintaining world's best practice for Australian wind projects'.

The CWFA system was used by local company Future Energy to audit the development of the 4 megawatt (MW) Hepburn Community Wind Park, expected to generate enough energy to power most of the homes in Victoria's Daylesford–Hepburn area and cut local greenhouse gas emissions by 14 000 tonnes per year.



Australia now has an accreditation system for wind farms to ensure best practice and secure community confidence. Codrington Wind Farm/ Pacific Hydro

The audit ensured the wind farm demonstrated compliance with industry guidelines and gave the community added confidence in the project.

'The system is straightforward and comprehensive and we would certainly recommend it for future projects big or small,' said Future Energy's David Shapero.

The scheme includes online tools and templates that provide step-by-step guidelines for meeting and validating industry best practice.

'Transparent and documented community consultation helps build trust and ongoing local relationships,' commented La Fontaine. 'The independent auditing process also assists regulators and planners fulfill their responsibilities, and the industry benefits through consistent practices and continual improvement.'

The scheme is administered by planning, environmental and engineering company PB and independent auditing is provided through a panel of internationally recognised certification bodies and the RABQSA International certification training group.

More support came to Australia's wind power industry after an announcement by Germany's largest solar energy company, Conergy, which plans to build a $2 billion, 1000 MW, 500-turbine wind farm at Broken Hill in NSW.

Andrew Durran of Conergy-owned Epuron Australia says the wind farm would provide enough power for 400 000 homes and reduce Australia's greenhouse gas emissions by at least 3 million tonnes of carbon dioxide per year. Construction of the wind farm – which will be the largest in Australia – is due to begin in 2009 and will be completed by 2012–13.

More information:
Auswind CWFA scheme, www.auswind.org/accreditation/about/

Novel enzymes the key to biofuels from trees and grass

New Zealand Crown Research Institutes Scion and AgResearch are working with the US-based Verenium biofuels company to genetically engineer new enzymes for converting cellulose from trees and grass into bio-ethanol, which could fuel the entire NZ vehicle fleet.

Cellulose is found in nearly all plant life and is the most abundant organic molecule on earth. Until recently scientists have found it uneconomic to convert cellulose into ethanol.

The research team is investigating the use Verenium's metagenomic enzyme technologies for developing robust enzymes that can cost-effectively convert wood from NZ-grown tree stocks into sugars for ethanol and other products.

It will also determine the technical and economic feasibility of a New Zealand biofuels industry, and produce a roadmap to identify potential risks or barriers to commercialisation.



New Zealand cars and trucks are on the road to being fuelled by trees. Scion

Currently more than 50 per cent of New Zealand's energy use is fossil-fuel based. Scion Chief Executive Dr Tom Richardson says NZ has seven per cent of its land mass in plantation forests and 'developing energy and climate change policies should anticipate an ever-expanding range of products and environmental services from these forest resources'.

Reminder about solar hot water rebates



Rinnai Beasley

The Federal Government's Australian Greenhouse Office (AGO) has sent out a reminder about its $1000 rebate on new solar hot water systems, provided that the applicant household:

- is switching from an electric storage hot water system; and
- has a combined taxable family income of less than $100 000 a year.

The rebate is available to both homeowners and renters.

The AGO says that in switching from an electric storage hot water system to solar, an average household could reduce its CO_2 emissions by 2–4 tonnes per year. This translates into annual savings of $300–700, depending on climate and number of people in the household.

In addition to federal and state government rebates, solar hot water systems come with tradable Renewable Energy Certificates (RECs), which can be used to provide a discount on the upfront cost of the unit.

More information:
www.greenhouse.gov.au/solarhotwer/index.htmlat

Need for more energy awareness by Australian companies?

Is there a disconnection between corporate 'green' energy efficiency rhetoric and reality within Australian firms?

According to a recent report by management consultancy Proudfoot, many Australian businesses – including those in the energy intensive manufacturing, mining, transport and logistics sectors – do not have a formal energy policy in place.

Proudfoot's report showed that 65.7% of the 102 companies surveyed have no published energy improvement goals. Around 51.9% of respondents said they do not measure or monitor energy KPIs (key performance indicators); 43% do not communicate energy expectations to employees; and 41.1% don't have a designated person or function responsible for energy.

New Zealand has a more progressive 'energy awareness' corporate culture, claims Proudfoot, with 36% of its companies having had an energy policy in place for more than six years, compared to only 7.5% of Australian companies.

However, according to Chris Wallbank of global commercial property services firm Jones Lang LaSalle, occupants of corporate properties are concerned about the need for energy use benchmark reporting systems because they are being increasingly required to report on the use of energy, waste and water.



High-energy-use corporations will soon be required to report on energy use and efficiency initiatives under the 2006 *Energy Efficiencies Opportunities Act*.

Jones Lang LaSalle manages more than 3000 properties around Australia.

Wallbank says the company has been developing a web-based data and assessment tool that will help its clients meet the requirements of the *Energy Efficiencies Opportunities (EEO) Act* 2006, to be introduced in December 2008.

'The EEO Act has set mandatory participation in a program for corporations using more than 0.5 petrajoules (PJ) (139 000 megawatts) of energy, or producing more than 125 kilotonnes (kt) of CO_2, within the 2008–2009 financial year,' says Wallbank.

'This means that most companies spending approximately $5 million or more in electricity each year, or over $1.5 million on gas, will be required to register and report on their emissions on or before December 2008.'

More information:
Department of Industry, Tourism & Resources' Energy Efficiency Opportunities program, www.energyefficiencyopportunities.gov.au

Double the value for power from domestic solar

The South Australian Government recently introduced solar 'feed-in' legislation that allows homeowners with solar photovoltaic panels to receive double-value credits for power they feed in to the grid.

Under the legislation, homes with small-scale grid-connected photovoltaic electricity systems will receive credits valued at twice the standard retail price for each kilowatt hour of electricity generated. South Australia accounts for 46 per cent of the nation's grid-connected solar panels.



The SA Government will pay twice the retail price for power from domestic PV units. Solaris

A youth-powered tsunami recovery

After the 2004 Boxing Day tidal wave brought a halt to traditional life, villages in south-western Thailand are being led by an innovative student-driven learning program to recover their livelihoods and develop solution-finding skills to better manage local natural resources.



Below: Thailand's spectacular south-western coast is home to fishing communities that host small tourism enterprises. James Porteous

In an open studio space just a few blocks from Bangkok's pulsing Khao San Road, Chaluaywan Panya – known simply to her friends as Tui – sits and talks with a quiet contentedness. She's pleased with the recent progress of 'Youth Leverage', the program she set up with partner Dr Opart Panya in mid-2005 to help remote southern Thai villages recover from the devastation of the tsunami.

The walls of the studio are plastered with photos of young students working with local groups – the smiles belie the incredible difficulties the villagers have faced since the disaster, but they also highlight a new positiveness, thanks to the local students that Tui's team has trained to find self-help solutions to the livelihood, environmental and social challenges facing these people.

From Ranong, just beneath Myanmar's lowest border, Thailand stretches 600 km south towards Malaysia in a leg-like, verdant peninsula. Its spectacular western coast, which took the brunt of the tsunami, is world-renowned for the archipelagos of near-shore islands that bejewel the Straight of Malacca.

But the remoteness of these more southerly islands and shores also makes life hard for the poor, mainly Muslim communities that have subsisted in the region for generations.

The tsunami destroyed whole villages and killed working family members, taking with it occupational tools, equipment and the means crucial to food and income – such as fishing boats and gear, or vegetable gardens – and in many cases permanently altered the coastal ecosystems. Some marine species important





Young village fishermen are learning to adapt to changed conditions after the tsunami.
Youth Leverage

'The program aims to get villages back together through the youth projects, helping people to see for themselves what is still "good" about their communities.'



to the communities, such as crabs, were irreparably depleted, and in other places the traditional balance of habitats has now changed, reducing productivity.

These effects have doubly compounded the difficulties of life and made the psychological impact of the disaster difficult to surmount.

'We felt that these isolated villagers needed a much more empowering alternative to the direct material tsunami aid that was getting through,' Tui says, revealing her motivations. 'We had to try to find a way to actually reunite the community, to restore a sense of purposefulness and pride around new livelihood options – that's the only way to really heal from something like this.'

'We also wanted to take the chance to build new skills and knowledge while working on cultural and research learning activities, and we felt that training the young people, to empower the rest of the village or town, was the answer for the long term. They have the enthusiasm.'

Although local and international agencies rushed to assist in the region by providing basic relief as well as replacing essential equipment, the well-intentioned efforts caused unexpected issues. Generally the relief was free, but some required villagers to pay for supplies over time. And where affected villages were closer to main access towns, multiple aid efforts actually became overwhelming and failed to consider any development plans already being run by the locals themselves. In many cases, the remoteness of affected communities meant relief didn't reach them effectively, or at all.

This caused further tensions and disappointment, and left communities feeling disempowered. Beyond that, there was little assistance given to restoring or dealing with environmental damage.

It was against this background that the Youth Leverage project was designed and then proposed for funding, through Mahidol University in Bangkok, where Tui and Opart teach community based natural resource management.

Dr Panya, who is also Board Chairman of Greenpeace South-East Asia, said that funding for







the project came from the Thai Health Authority after Mahidol University had already run projects, in conjunction with the Undergraduate Volunteers Foundation, to collect data on the tsunami's effects on ecosystems in the region.

'This early tsunami work involved us with southern villages and showed us that something was needed to engage the youth of the affected communities,' he says.

'In Thai society there is a lack of knowledge of both local ecosystems and local culture – it's not a strong enough part of the curriculum. We saw that the Youth Leverage program could involve post-graduates from the university getting experience by training the younger people of the affected villages in how to design and research projects on their local environmental issues and cultural history.

'The program aims to get villages back together through the youth projects, helping people to see for themselves what is still "good" about their communities. It gives empowerment through new skills and knowledge, but with cultural sensitivity,' Dr Panya says.

After meetings at Mahidol University identified that the preference was ultimately to try wherever possible to empower marginalised groups – such as Muslim women and children – 20 graduates from universities around Thailand were selected to work with young students of 20 villages in six provinces along the south-western coast.

Top right: Fish rearing cages were designed by the Youth Leverage project in Thambon Tha Nglo village, Trang Province. Youth Leverage

Top left: Tui Panya is building capacity through her Youth Leverage program. Youth Leverage

Bottom left: Village students learning to research with their teacher and Mahidol University graduate coordinator. Youth Leverage

The university held workshops to train the graduates in how to teach informal research techniques to the village students so that they could then investigate the most important issues in their villages. This aimed to develop an investigative nature and process.

Supported by the graduates and their local teachers, the students were then divided into groups and asked to inquire among parents and elder village members about the main environmental and resource priorities, local cultural history issues and the potential for community managed ecotourism opportunities. They were also given disposable cameras to record their inquiries.

'This got everyone thinking and remembering and helped them to appreciate their community, as well as to understand that things could be done,' says Tui. 'They started thinking for themselves.'

'We then encouraged the students to design solutions for a conservation project around what they discovered, by all working together. The outcomes were then presented to the village to be shared and accepted. The results inspired everyone and got older village members enthusiastic about the potential for change.'

As a result of this process that Tui calls 'living research,' many of the village projects decided on

18 months ago across the six provinces are now underway, supported by funding from the Youth Leverage program. While there are differences in the thoroughness, progress and participation in the projects depending on the village, it's the fact that some are showing signs of real, long-term practical success that most satisfies Tui and Opart.

'The villagers involved say they have more optimism now and a sense of independence,' says Tui. 'That's what we hoped for.'

After the tsunami hit the fishing village of Ban Thayarng in Ranong Province, fishermen noticed an immediate decline in the crab fishery they rely on for food and income. This was being made worse by poaching from other fishermen with more sophisticated gear, and the fishery was under threat.

Through identifying and discussing this issue with the fishermen, the students involved in Youth Leverage thought of a meshed cage system that when submerged would hold and protect large egg-laden female crabs, allowing hatched larvae to escape and grow locally to replenish the fishery. The project now has six active village members and the cages deployed since last year appear to be working well.

At Ban Bor Jet Luk in Satun Province, students identified that the local fish population was depleting and an alternative income source needed to be found. After consultation, they decided that a tourism and learning centre with accommodation for visitors would be worth a try to showcase the customs and natural assets of the area.

By November 2006 the project was up and running and the first visitors reported a very enjoyable experience. Since then the project has bedded down and is aiming to do some concerted marketing.

After recognising in their project that the nearby reservoir was an underutilised resource, the students of Thambon Tha Nglo in Trang Province suggested setting up fish rearing cages as a way to supply food to the village as well as generate new income from local sales. One hundred cages have now been established which are capable of generating 12 000 Baht (AU$400) per month for the 17 stakeholders now taking part. The students even designed a rotation system to ensure that those with the oldest fish sell their product first, avoiding competition.

Further north in Ranong Province, the villagers of Ban Tung Nang Dam have been making the most of the marine debris scattered by the tsunami. Their project centres on making small ornaments and artefacts for sale to tourists from driftwood and other material washed onto their beaches. They are also researching a process of tissue culture cultivation in order to propagate and protect a rare orchid which grows in their region, but is being stolen by outsiders for sale.

Meanwhile, in Ban Buu Boi, Satun Province, the locals are finding advantage from the influx of jellyfish which suddenly appeared after the tsunami, forcing a change to regular fishing. As a result of their Youth Leverage involvement, villagers are now working with outsiders to harvest the jellyfish and process them in small shore-side 'factories' for export to Bangkok where the jelly is further refined into commercial agar. The project has united the village and provided a very successful alternative livelihood for many families – another clear success of the program.



A local woman processes jellyfish, now common after the tsunami, at Ban Buu Boi, Satun Province. Youth Leverage

As Tui and Opart encourage the development of the current projects and refine the Youth Leverage training for future ones, they are clear about the overarching goal of the process. 'We want these children and their communities to learn to have wise use and management of their natural resources,' Dr Panya says. 'We also encourage them to use their local voice to work with provincial authorities. They shouldn't just passively take government direction and advice anymore. Now they know they can think for themselves.'

Tui points to a photo that shows a tangle of Thai children playing in the ocean. 'Last year we brought as many of the program's students as we could together for a day so they could meet and learn from each other,' she says. 'It was a very happy day – very satisfying to see how much confidence and assuredness these young people had all gained from their training experience. There were instant friendships, religion didn't matter.'

As it looks ahead, the Youth Leverage team is hoping for some more substantial funding and support from a large organisation. 'We have plenty more to do,' Tui says with a smile. Judging by the achievements so far of this comparatively small and modestly funded post-tsunami relief effort, any support that is pledged will be a worthy investment.

● **James Porteous**

Focus

Seeing the wood for the trees



What to look for when purchasing carbon credits

While paying for tree-planting or buying renewable energy credits has become a popular way for people and organisations to offset carbon emissions, not all carbon offset options are the same, write **Mike Smith** and **Karlson Hargroves.**

After the Kyoto Protocol sanctioned greenhouse gas (GHG) offsets as a way for governments and private companies to earn greenhouse gas credits for trading, offsetting became a key part of major emission trading schemes, such as the European Union Emission Trading Scheme.

But a recent *Financial Times* report[1] on the UK carbon offset market found 'widespread failings in the new markets for carbon offsets, suggesting some organisations are paying for emissions reductions that do not take place'.

In addition the report found that:

- Some industrial companies are profiting from doing very little, or from gaining greenhouse gas credits on the basis of efficiency gains from which they have already benefited substantially.
- Brokers are providing services of questionable or no value.
- A shortage of verification exists, making it difficult for buyers to assess the true value of greenhouse gas credits.

In fact, critics argue that the carbon offsets industry is allowing individuals, organisations and countries to think it is alright to keep polluting.[2]

Chris Martin, the famous lead singer of UK rock band Coldplay, is an example of this. In an interview for *The Guardian* in 2005,[3] whilst espousing the need for us all to play our part to preserve the planet, Chris revealed that he drives a fuel-inefficient sports car and frequently travels in his own private jet. He said he had bought the private jet partly so that his daughter Apple, when she is older, could fly and join him at his concerts whenever she wished to do so.[4]

Chris's excuse for this highly carbon intensive behaviour was that he and Coldplay offset their emissions. In 2002, Coldplay paid British company Future Forests to plant 10 000 mango trees in India to offset the emissions from creating their second album. In 2006, the UK *Daily Telegraph*[5] reported that at least 40 per cent of the saplings had died as a result of water shortages – negating the greenhouse gas storage they were meant to provide.

Further, several failures around the world have fuelled criticism of offset schemes under the Clean Development Mechanism.[6] The Clean Development Mechanism (CDM), established by the Kyoto Protocol, allows industrialised countries with a binding greenhouse gas reduction commitment to invest in greenhouse gas offset projects in developing countries. Failures of the CDM include carbon offset projects in South America[7] and Africa.[8]

1 Harvey F and Fidler S (2007). Industry caught in greenhouse gas smokescreen. *Financial Review, London*. www.ft.com/cms/s/0/48e334ce-f355-11db-9845-000b5df10621.html
2 Smith K (2007). The Carbon Neutral Myth: Offset Indulgences for Your Climate Sins. Carbon Trade Watch, Transnational Institute, pp. 29–42. www.carbontradewatch.org/pubs/carbon_neutral_myth.pdf
3 McLean C (2005). The importance of being earnest. *The Guardian*, 28 May 2005.
4 Monbiot G (2006). Greenwash Exposed – Chris Martin. http://www.turnuptheheat.org/?page_id=12
5 Dhillon A and Harnden T (2006). How Coldplay's green hopes died in the arid soil of India. *Sunday Telegraph*, 30 April 2006.
6 Smith K (2007). The Carbon Neutral Myth: Offset Indulgences for Your Climate Sins. Carbon Trade Watch, Transnational Institute, pp. 29–42. www.carbontradewatch.org/pubs/carbon_neutral_myth.pdf
7 Granda P (2005). Carbon Sink Plantations in the Ecuadorian Andes: Impacts of the Dutch FACE-PROFAFOR Monoculture Tree Plantations. Project on Indigenous and Peasant Communities. www.wrm.org.uy/countries/Ecuador/face.pdf
8 Lang C and Byakola T (2006). A funny place to store carbon: UWA-FACE Foundation's tree planting project in Mount Elgon National Park, Uganda World Rainforest Movement. http://www.wrm.org.uy/countries/Uganda/Place_Store_Carbon.pdf

Left: Carbon offset projects involving tree-planting also help to preserve biodiversity and restore habitat. CO_2 Australia

As a result of such failures, a number of new non-government organisations[9] have been set up with the sole purpose of monitoring GHG offset projects.[10]

However, it's important to note that offsets are *not* the solution to reducing GHG emissions. Rather, they should be seen as one component of a broader GHG reduction approach that requires, first, that society uses energy more efficiently, and secondly, that it shifts to using low-carbon energy sources. Virtually all businesses and households in Australia can now purchase 100 per cent renewable energy from an accredited green power supplier,[11] and most Australians can easily make other lifestyle changes, such as buying locally grown food.

Only then does it make sense to offset the remaining balance of our emissions using greenhouse gas offsets.

Key selection criteria

In a recently published report,[12] Leonardo Ribón and Helen Scott from the Global Sustainability Institute at RMIT argue that 'criticism of the carbon offset industry is justified, as only some Australian carbon offset service providers communicate on their websites that offsetting emissions is only one element of a comprehensive greenhouse gas strategy. Only a few organisations do encourage their clients to measure, reduce and then offset, rather than purely offering the offset service.'

Yet there is some evidence the carbon offset industry is starting to address these criticisms.

Brendan Condon, Founder of carbon offsets provider Climate Positive, has stated that 'offsets can play a part in the climate protection strategy, but they cannot be used as a mini licence to pollute. We must reduce our footprint dramatically before we offset. At Climate Positive we're very clear; we want passionate partners in reducing global warming, not passive consumers of a product.'[13]

Steps are also being taken to improve quality assurance standards for offsets. Many Australian carbon offsets are now either accredited, or in the process of getting accredited, with the Australian Greenhouse Office's Greenhouse Friendly program. (A useful table comparing offset providers in Australia can be found on p. 4 of the Ribón and Scott report at www.global.rmit.edu.au/GreenhousegasOffsets2007.pdf.)

Purchasers need to have confidence that the greenhouse gas offsets they pay for are generated from projects that are accurately and reliably verified.

In their RMIT report, Ribón and Scott developed a set of criteria that can help customers choose between offset products:

- *Additionality:* Would the project have occurred anyway without funding from greenhouse gas offsets?
- *Baseline determination:* Does the provider state commitments to a robust process to determine the baseline greenhouse gas emissions?
- *Benefit quantification:* Does the provider have a track record of accurate quantification of emissions reductions or has that provider had failures in the past? Do the figures quoted reflect uncertainties?
- *Permanence:* Are there risks of loss of greenhouse gas from bushfires and drought? Is there a risk that customers will not install compact fluorescents? Is there a potential for future reversal of sequestration?
- *Ownership and registration:* Is ownership of offsets clearly and formally registered? Is there any possibility of offsets being sold many times over?
- *Monitoring and verification:* Does the provider commit to regularly monitor, verify and report greenhouse gas offsets over time?

The fact is, because the voluntary greenhouse gas offsets market is immature, no universally accepted standards for product quality have yet gained market dominance. But some standards exist to provide quality guidance or certification for some areas of the greenhouse gas offsetting process. In their report, Ribón and Scott point out the following examples of this:

- *Measuring and accounting for GHG emissions:* The main global standards here are the GHG Protocol for Project Accounting and the Corporate Accounting and Reporting Standards released jointly by the World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). There is also the International Organisation for Standardisation's ISO 14064 standard for GHG accounting and verification.
- *Abatement projects that create emission-reduction credits:* These standards and protocols establish whether the GHG reduction project is credible. Examples include the Gold Standard for Voluntary Offsets, the Voluntary Carbon Standard (VCS), Australian Greenhouse Friendly initiative, and Origin Energy's Carbon Reduction Scheme (CRS).
- *Standards that certify a scheme for selling offsets:* These include the UK Government's Code of Best Practice.
- *Standards that can certify whether an organisation or product has credibly offset its emissions:* This ensures the organisation or product can be marketed as 'greenhouse gas neutral'. Examples in Australia include the AGO's Greenhouse Friendly initiative.



Investments in new renewable energy projects, such as geothermal, last for decades and support the development of a low-carbon economy. Geodynamics

In Australia, the most common greenhouse gas offset projects involve renewable energy, energy efficiency and forestry/revegetation (bio-sequestration).

9 Greenhouse Gas Trade Watch, www.greenhouse gastradewatch.org/
10 SinksWatch, www.sinkswatch.org/
11 Australian Government-accredited green power options, www.greenpower.gov.au/home.aspx
12 Ribón L and Scott H (2007). Carbon offset providers in Australia 2007. Global Sustainability at RMIT. www.global.rmit.edu.au/CarbonOffsets2007.pdf
13 Lester B (2007). Smoke and mirrors. *GMagazine*. May/June, pp. 50–53.

Focus



Under Kyoto's Clean Development Mechanism, industrialised countries can meet emission reduction targets by investing in emission-reduction technologies, such as solar cookers, in developing countries. The Solar Cooking Archive

Offsets from renewables

Renewable energy projects include wind, solar, geothermal, landfill gas capture, biomass and some hydro generation. Under the Australian Mandatory Renewable Energy Target (MRET), a Renewable Energy Certificate (REC) is equivalent to 1 MWh of renewable energy generation, which offsets approximately 1 tonne of CO_2.

Renewable energy projects provide a measurable way to reduce emissions that would otherwise be produced from burning fossil fuels.

Investments in new renewable energy projects also last for decades, ensuring the money invested makes a lasting difference. Further, renewable energy credits created and certified under a government scheme have high market credibility.

Offsets from energy efficiency projects

Energy efficiency projects can offset emissions by reducing the amount of energy needed from an original baseline level of energy usage. The quantified difference between energy used before and after a particular energy efficiency measure is implemented is what is used to create a greenhouse gas offset.

National Framework for Energy Efficiency (NFEE) research shows there is significant potential for energy efficiency to significantly reduce greenhouse gas emissions. NFEE's publications show that 30–70 per cent potential energy efficiency savings exist throughout the Australian economy.[14]

Critics of greenhouse gas offsets from energy efficiency projects argue that companies, governments and homeowners should be investing in energy efficiency opportunities anyway. This is because many energy efficiency investments have a rapid return on investment leading to long-term financial savings.

Greenhouse gas offsets from bio-sequestration

Bio-sequestration projects have been criticised for their vulnerability, particularly the risk of greenhouse gas re-entering the atmosphere as a result of fires or drought-induced tree death. As some parts of Australia enter their 11th year of drought, and scientists warn of higher risks of bushfires in coming decades, it is hard to see how bio-sequestration projects can guarantee carbon storage.

However, the key point to make is that reafforestation and revegetation projects are enormously important in helping to preserve biodiversity and restore habitat. It is significant that national 'icon' organisations such as Greening Australia – which has over 20 years' experience in working with more than 10 000 Australian farmers – are now entering the greenhouse gas offset market with greenhouse gas offset products that also promise to restore biodiversity to the Australian landscape.

These same organisations are making efforts to minimise the risk of bushfire and drought impacts on their bio-sequestration projects. Also worth noting is that timber products and paper from sustainable plantations can store greenhouse gas for over 1000 years, as shown by recent research from the ANU and CRC for Greenhouse Accounting, reported in an earlier issue of *Ecos*.[15]

Bio-sequestration accounting

One of the challenges of bio-sequestration projects is accurately measuring the amount of greenhouse gas stored. To address this, the AGO has sent thousands of its free National Greenhouse Gas Accounting Toolbox CDs[16] to farmers and landholders.

The toolbox enables users to track greenhouse gas emissions and 'greenhouse gas stock' changes from different land-use and management options.

The former CRC for Greenhouse Accounting[17] developed simple online calculators that allow farmers and plantation managers to accurately calculate how much CO_2 they are sequestering through changing land-use patterns and through afforestation, reafforestation and revegetation efforts.

In summary, carbon offsets need to be seen in the context of a broader portfolio of climate change mitigation strategies, including energy efficiency and sourcing energy from low-carbon sources.

More information:

Ribón L and Scott H (2007). Carbon offset providers in Australia 2007. Global Sustainability at RMIT. www.global.rmit.edu.au/CarbonOffsets2007.pdf

The Natural Edge Project (2007). Sustainable Energy Solutions Portfolio. Lecture 3.10 – Beyond energy efficiency and distributed energy: Options to offset emissions. www.naturaledgeproject.net/Sustainable_Energy_Solutions_Portfolio.aspx

14 Energy Efficiency and Greenhouse Working Group (2003). Towards a National Framework for Energy Efficiency – Issues and Challenges Discussion Paper. NFEE. www.nfee.gov.au/about_nfee.jsp?xcid=64

15 Smith M and Hargroves K (2006). Wood – another low greenhouse gas footprint solution. *Ecos* **129**, 12–13. www.publish.csiro.au/?act=view_file&file_id=EC129p12.pdf

16 AGO National Greenhouse Gas Accounting Toolbox, www.greenhouse.gov.au/ncas/ncat/index.html

17 CRC for Greenhouse Accounting calculators, http://www.greenhouse.crc.org.au/tools/calculators/

The dangers of short-termism

If confirmation was ever needed, the recent federal election campaign has demonstrated just how dangerous our craven idolatry of 'here-and-now' short-termism has become.

After months with reality suspended, the new government now has to face the stark fact that we are in the midst of nothing less than a global emergency, brought about by the rapid escalation of human-induced climate change and the imminent peaking of global oil supply. The news is universally bad:

- In Australia the drought is worsening, capital city water supplies are deteriorating and the bushfire season does not bode well. The latest CSIRO and IPCC assessments highlight the risk of continuing climatic deterioration.
- Arctic sea ice is melting more rapidly than even the highest IPCC forecasts. This has serious implications for the warming of northern waters and global climate in general.
- Extreme weather events are escalating worldwide, from widespread flooding across Africa, to intense storm activity in the US, Europe, India and China.
- The price of oil could head north of US$100 per barrel, yet peak oil is barely on the agenda in this country, despite the first, grudging, official admissions internationally that it may soon become a reality.

Unfortunately the system we have created has rendered us uniquely ill-equipped to handle this emergency. Despite our impressive advances in science and technology, our ability to use the power these advances have bestowed responsibly has dramatically declined, bearing out Robert Theobald's lament that 'as information doubles, knowledge halves and wisdom quarters'.

Politically, in earlier eras we had statesmen and women, prepared, in the interests of humanity, to take a broader view than narrow national self-interest. Nowadays, spin and party loyalty dominate, with a time horizon no further than the next media poll.

Corporately, perverse incentives have led to a paranoia with short-term performance. Organisations previously highly regarded for their long-term thinking have dispensed with that expertise, in the process losing valuable corporate memory.

Research organisations, such as CSIRO, are under pressure to find external funding, which, given the current paradigm, means a focus on short-term projects, to the detriment of long-term fundamental research. At a time when we are in desperate need of a long-term view, we are moving in exactly the opposite direction.

In particular, we need an ability to 'join-the-dots', to develop inter-disciplinary, holistic solutions to the major issues that are bearing down on us, rather than treating them in separate silos as at present. We need scenarios, unadorned by political spin, that allow us to explore the futures confronting us, globally and nationally, and the extent to which we can create those futures. But it does not seem to be happening. Why not? It should be a national priority.

Part of the process is to re-think our values, to 'think the unthinkable'! An ideological preoccupation with a market economy based on short-run profit maximisation is rapidly leading toward an uninhabitable planet. As inconvenient as it may be politically, conventional economic growth and rampant consumerism cannot continue. Markets are important, but they operate within rules. Henceforth, the rules must change to ensure long-run sustainability.

● **Ian Dunlop**



Melbourne's lights illuminate the falling dusk. Dave Townsend

After months with reality suspended, the new government now has to face the stark fact that we are in the midst of nothing less than a global emergency, brought about by the rapid escalation of human-induced climate change and the imminent peaking of global oil supply.

Ian Dunlop was formerly an international oil, gas and coal industry executive. He chaired the Australian Coal Association in 1987–88, chaired the Australian Greenhouse Office Experts Group on Emissions Trading from 1998–2000 and was CEO of the Australian Institute of Company Directors from 1997–2001. He is Chairman of the Australian National Wildlife Collection Foundation (CSIRO), and Deputy Convenor of the Australian Association for the Study of Peak Oil.

Counting whales in the ice



Aerial surveys will help with the question of Minke whale numbers.
Kevin Neff

For the first time, Australian scientists will use aircraft to count minke whales in the pack ice around Antarctica.

Since 1978 the International Whaling Commission (IWC) has been counting whales in the Southern Ocean for management and conservation purposes. Each year ships, provided by Japan, cover about one-tenth of the Southern Ocean, with each survey in the unstrengthened vessels necessarily ending at the edge of the pack ice around Antarctica. Thus, every 10 years, a circumpolar snapshot of whale abundance is obtained.

Surveys over the past two decades, however, suggest there has been a significant decline in minke whale abundance, leading to disputes over whether the decline is genuine, or an artefact caused by the survey technique.

One theory is that changes in the ice edge boundary each year, and changes in the number of minke whales present in the pack ice beyond this boundary, could be responsible for the differences in estimates of the whales in open water. In other words, could there be more minke whales hiding under the hundreds of kilometres of pack ice (and open areas within the pack ice), where the ships can't search?

Using icebreaker ships to access the pack ice is not ideal for a number of reasons, including the whales' responses to engine noise. In the 2007–08 Antarctic season,[1] a team from the Australian Antarctic Division aim to use the Division's two C212 fixed-wing aircraft to trial an aerial survey of the relative abundance of whales off the coastline adjacent to Casey, Australia's closest Antarctic station, located in the Windmill Islands. The plan is to fly the planes at an altitude of about 180 m and cover at least 2500 nautical miles – flying over a mixture of pack ice and open water.

The aerial survey will be conducted at the same time as the annual ship-based survey (the Southern Ocean Whale Ecosystem Research survey), covering the pack ice region that the ship cannot access. It will be done in such a way that the data from both methods can be compared.

Information from the surveys will be used by the IWC, but will also contribute to the Australian Antarctic Division's research (through the Australian Centre for Applied Marine Mammal Science) into minke whale distribution and abundance, and their interaction with other whale species and krill predators. The research feeds into conservation management, setting sustainable catch limits for whales and krill, and contributes to scientists' understanding of ecosystem changes due to climate change. This first aerial survey will also test the reliability of this research technique.

● **Wendy Pyper**

This article is republished from Australian Antarctic Magazine (AAD) *issue 13.*

1 Scientists undertaking the research will be amongst the first to fly to Antarctica on a new Airbus A319 personnel aircraft. The timing of this research will therefore depend on the weather.

Modifying aircraft for whale surveys

The C212 aircraft have been modified for the survey in a number of ways including:

- digital video and infrared video systems mounted under the aircraft to record everything within a strip at least 50 m on either side of the aircraft;
- a wide-angled, still, digital camera mounted under the aircraft to record ice images at least 100 m either side of the aircraft at regular intervals; and
- additional software incorporated to access altitude information from aircraft data logging systems, improving survey result accuracy.

As well as these modifications, the Global Positioning System will be available to accurately record whale sighting locations, and the two front and two rear observation units will be visually and audibly isolated from each other to ensure independent recording of information.

Due to the nature of the operation (including the potential for extended periods of flight over open water at low altitude), project team members have undertaken additional emergency training relating to egressing ditched aircraft, cold water hazards and life raft deployment.



The C212 aircraft have undergone a range of modifications for whale survey work.
Frederique Olivier



Humpback whales will be counted on their winter migration past Queensland's coast. Joshua Smith and Michael Noad

Population survey pilots an unmanned aircraft

Robotic aircraft or 'Unmanned Aerial Vehicles' (UAVs) could soon take to the skies in the name of marine mammal research, if a pilot project to test the technology succeeds.

Through the Australian Centre for Applied Marine Mammal Science, Dr Amanda Hodgson and Dr Michael Noad, of the University of Queensland, will conduct and compare traditional manned and UAV surveys of dugongs and humpback whales, to test whether UAVs can improve the safety, cost-effectiveness and accuracy of marine mammal population surveys.

'Aircraft hire and personnel costs mean that traditional manned aerial surveys are expensive, and eight people have died over the past 20 years after aircraft crashed during aerial surveys,' Dr Hodgson says.

'So we want to determine whether UAVs offer a better way of monitoring marine mammal populations, by reducing the cost and the risk, and by increasing the accuracy of species detection, location and identification using on-board imaging technology.'

UAVs have been around since the 1950s and developed for a range of applications including defence, weather research, and search and rescue. They are largely untested in wildlife research, but they have the potential to be used at night – with infrared cameras attached – or in extreme environments. Their lower cost would also enable more aerial surveys to be conducted, improving population estimates.

The research team will use a large (5 m wingspan), commercially available UAV, supplied by Aerocam Australia and equipped with video and still cameras.

'A larger UAV can carry more equipment and a lot more fuel – allowing us to cover the greater distances necessary for whale surveys,' Dr Noad says.

The first phase of the project will test the basic capabilities of the UAV for viewing and surveying marine mammals. It will ask a range of questions, including: Does the UAV provide video and still images that can be easily analysed by researchers or image analysis programs? What is the optimal camera height and system for different species? Can images be viewed in real time to enable operators on the ground to alter the flight path when animals are sighted? How much post-flight analysis of images is required?

Dugongs and humpback whales are being targeted as they live in different environments, are sighted using different cues from the air, and have very different movement habits and aggregation patterns.

'Dugongs sometimes congregate in large herds of up to 300 individuals, and need to be circled to be counted,' Dr Noad says.

'Migrating humpback whales usually travel singly or in pairs, and often you just see their blows before they submerge again. They're spread out on a long migratory path, so you have to cover quite a bit of ocean to find them.'

For dugongs, the UAV will fly transects over Moreton Bay and Hervey Bay, in south-east Queensland, and when a herd is sighted – through the live video link – researchers will take over the controls and circle the herd to get an accurate count.

Humpback whales will be located during their winter migration past North Stradbroke Island, and the UAV will again be tested at varying heights above the animals. Still and video images will then be compared to see if there is any advantage of one over the other.

'Still images will likely have a better resolution than video images, but it may be easier to detect whales from movement in the video,' Dr Noad says.

If this first phase of the project proves successful, the researchers will move on to the second phase – to directly compare the results of UAV surveys with manned surveys.

The scientists admit this is a high-risk project. But even if the technology does not prove adequate today, with the pace of development, it may be in just a few years' time.



The Aerocam UAV should greatly lower the cost of aerial surveys. Aerocam Australia

'In the medium to long term, smaller UAVs could reduce the cost of flights to just a few dollars an hour, while better imaging software could negate the need for human analysis at all,' Dr Noad says.

● **Wendy Pyper**

This article is republished from Australian Antarctic Magazine (AAD) *issue 13.*



Chain reactions

A long-fought campaign to preserve a pristine and remote stretch of the South Australian coastline – home to the endangered osprey and white-bellied sea eagle – is highlighting the critical national issue of coastal development impacts. Local groups are rallying the state government over the need for a development management plan covering four largely undisturbed bays. **Christine Williams** reports.

The spectacle of a remote chain of bays glittering in the morning sun may be an uplifting and sought-after sight for humans, but for original wildlife inhabitants – like birds of prey and sea lions – it's the absence of people that means survival.

Corvisart, Sceale, Searcy and Baird Bays on the western Eyre Peninsula are the subject of a proposed management plan covering about 100 kilometres of spectacular, winding coastline, roughly 700 kilometres from Adelaide. It's a region of low rainfall and varied vegetation types, from mangrove to saltbush, which grow across wetlands, shifting dunes and bare sea cliffs.

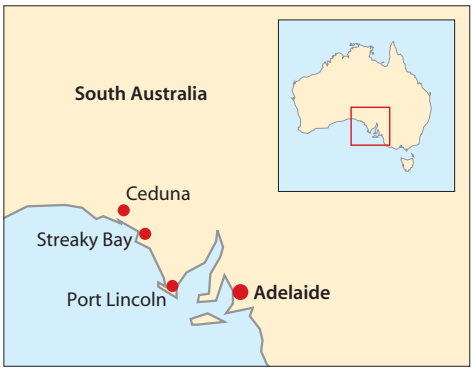
With urban populations increasingly in search of a 'sea change lifestyle', the belief that everyone has a right to a scenic ocean view is more and more in conflict with the rights of precious species to have their habitats protected. This is the scenario now being faced by the local community of Streaky Bay.

Unlike other parts of Australia, the western Eyre Peninsula coastline does not have coastal forest, and osprey and sea eagles' nests are carefully perched on sea cliffs and open terrain. Any approaching humans tower above the top of a nest and are considered a threat by the bird, causing them to lift off the nest, leaving eggs to cool and young birds to become easy prey to predators.

The Friends of Sceale Bay lobby group, which since 1999 has been running a series of individual battles over attempts to develop in sensitive coastal areas, is alarmed by recent development proposal approvals. They include an application for a large home overlooking the bay, which would intrude on precious nesting areas. The residence – planned to be built by an American, being represented by a local real estate agent – has been given the go-ahead by a Council Development Assessment Panel, endorsed by the local Streaky Bay Council.

Council Mayor, Ian Gunn, would make no comment after explaining that he is not authorised to speak, as it was a decision by the Panel, whose members are also not able to comment publicly. However,

Above: The previously remote 'Chain of Bays' region of the Eyre Peninsula is the subject of a long-running debate over human encroachment.
Grant Hobson







Osprey build spectacular nests on precipitous cliffs to outsmart predators. Grant Hobson

there is hope among conservationists that the Native Vegetation Council (a statutory authority reporting to the Department of Water, Land and Biodiversity Conservation on impacts to native vegetation) might rule against land clearance for construction on the site above Sceale Bay, which is within 'Coastal Zoning' and therefore subject to strict provisions.

A spokesperson for the Native Vegetation Council has confirmed it is familiar with the process that will be applied to the development application that has already received initial local planning consent.

'The Native Vegetation Group of the Department will be undertaking an inspection of the site and a report will be prepared for consideration by the Native Vegetation Council,' a Council spokesperson explained.

The Streaky Bay Council go-ahead came in the face of the South Australian Minister for the Environment, Gail Gago, urging the Council to consider the advice of her Department's Coast Protection Board, while acknowledging she did not have 'the power to override the Council's decision'. The Coast Protection Board had advised that the building development should be refused, referring to a coastal environment of high scenic quality and environmental value, which should not be threatened by further development.

'I'm very concerned that the Council's decision will open the floodgates and lead to spot development along this pristine coastline,' Minister Gago said.

She also pointed out that in 2006 the Sceale Bay Conservation Reserve was upgraded to 'Park' status 'in recognition of the important environmental significance of the region'. About 30 000 tourists visit the region each year, and if development is allowed to proceed unchecked, the natural environment will likely be damaged by the pressure of increasing numbers – as has been the case in many other coastal areas.

Two years ago the Friends of Sceale Bay submitted a proposal for a development management plan for a 'Chain of Bays' and Ms Gago says this 'was an extremely valuable starting point'. Further comprehensive investigation of environment and land tenure is almost complete and due for her consideration, she says.

The fact that an island with a breeding colony of Australian sea lions was found by a researcher off the Chain of Bays as recently as 2002 is evidence of the remoteness of the area and its particular value as an isolated site suitable for habitat protection.

Dr Peter Shaughnessy of the South Australian Museum (and formerly with CSIRO Sustainable Ecosystems) first heard of sea lions located on the unnamed island near Sceale Bay in 2001. During the next pupping season Shaughnessy was able to verify that the unnamed island, now called Nicolas Baudin Island, did indeed support a breeding colony of sea lions – with high pupping numbers.

Since then Shaughnessy has visited the island and the Chain of Bays a dozen times and estimates the total sea lion population in the region at about 1300 – 12 per cent of the total estimated national population of 11 000.

But it's not only sea lions that depend on the Chain of Bays marine environment. New Zealand fur seals also feed offshore, hauling themselves onto rocks along the mainland shore at Point Labatt.

And the only place in the world that a unique 'diminutive' sea star, named *Parvulastra parvivipara*, has so far been found is a small localised area in the Chain of Bays. Described, like others in the region, as 'small range endemic', the sea star survives in and around rock pools on five outcrops of granite and basalt along the west coast of the Eyre Peninsula between Point Labatt

Below: Majestic white-bellied sea eagles share the coastline with the osprey and peregrine falcon. Grant Hobson







and Cape Vivonne, plus similar habitats around offshore islands in the region. Claimed as the world's smallest sea star, it has an average diameter of just 5 millimetres but exists in abundant numbers in this area.[1]

A specialist researcher into raptor habitats, Terry Dennis, says there's evidence of a 40 per cent decline in white-bellied sea eagles in South Australia since records have been kept, due primarily to the expansion of human habitation.

Dennis says that, in particular, most of South Australia's coastline has been degraded through a number of causes: agriculture, feral and domestic animals, exotic plants, inappropriate burning, uncontrolled recreational use of 4WDs, and expanding urbanisation.

'When the wilderness quality of remote coastlines is diminished, the habitat and survival of sensitive wildlife species can be seriously threatened,' he says.

'Eagles, for example, require large foraging territories and nest site sanctity with surrounding wilderness as buffer areas, for successful breeding.

'Both the osprey and the white-bellied sea eagle have recently been listed as "Endangered" in South Australia because they face population decline as a result of degradation of their habitats.'

Australia's foremost authority on raptors, Dr Penny Olsen from the Australian National University, agrees with Dennis's conclusion that the white-bellied sea eagle needs special protection in South Australia, saying they're 'thin on the ground' in that state.

'Top predators are very important in any ecosystem. If they're in evidence in good numbers it's a sign that everything below that order is in good environmental health,' she says.

'Apart from that scientific rule, these birds are simply magnificent creatures deserving of habitat protection.'

Dr Olsen is also concerned for the habitats of osprey in South Australia, since these are part of the southern-most osprey populations in Australia, and the world. Osprey are not found in Victoria or Tasmania, according to Dr Olsen.

Convenor of the Friends of Sceale Bay, Grant Hobson, emphasises the urgent need for a new linked

Above: Dr Peter Shaughnessy conducting counts of Australian fur seals on Nicholas Baudin Island.
Grant Hobson

Top right: Under the SA Government's Coastal Viewscapes Project, the Eyre Peninsula is rated as having among the highest scenic value levels of the state's coastlines.
Grant Hobson

Right: Australian fur seal with an Australian sea lion.
Grant Hobson



conservation park to protect 'intact' the series of ecological systems – both marine and coastal land habitat – which stretch along the Chain of Bays coast.

Hobson sees the Chain of Bays as 'a series of interconnected systems from marine to coastal to wetland to mallee, protected previously by its sheer isolation, harsh dry climate and vastness.'

'The state government has a Marine Protected Area (MPA) policy which is being rolled out over five years, but we also see the need for a coastal land component to be included urgently,' he says.

'All the state funding and administration which is being expended on sustainable development and protection of biodiversity habitat is useless if it continues to break down at the level of local government decision-making, which allows inappropriate development to go ahead.

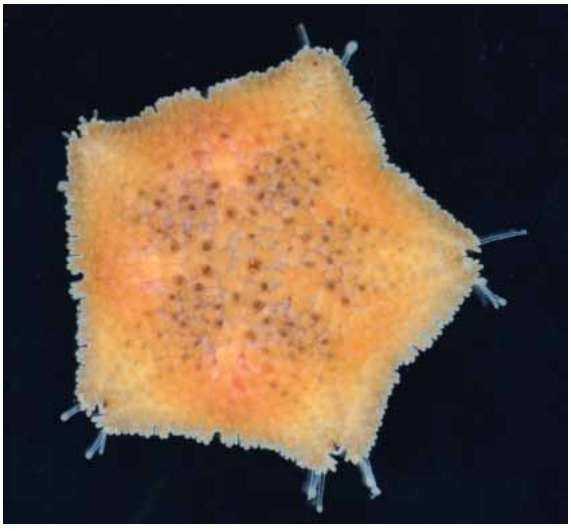
'The Streaky Bay Council is running roughshod in approving houses which pose a significant threat to pristine remnant coastal habitat.

'The state government needs to urgently provide effective conservation management and development controls through legislation which cannot be

1 See Byrne M, Cerra A, Hart MW and Smith MJ (1999). Life history diversity and molecular phylogeny of the Australian sea star genus Patiriella. In *The other 99%: The conservation and biodiversity of invertebrates*. (Eds W Ponder and D Lunney), pp. 188–195. Transactions of the Royal Society of NSW.







circumvented by local bodies,' Hobson explains.

In early November, *Ecos* was advised that the Department of Environment and Heritage had begun working with Planning South Australia to determine a proposed Coastal Conservation Zone, including taking expert advice from Terry Dennis on appropriate buffer distances for osprey, white-bellied sea eagles and peregrine falcons.

Meanwhile, the SA Environmental Resource Development Committee – a Parliamentary Standing Committee – recently completed a year-long inquiry into coastal development and its effects on the environment. The Committee's report,[2] which was tabled before Parliament rose in late November, included recommendations and proposals to close loopholes which allow residential and other development on areas of high environmental and scenic value – such as on pristine dunes and coastal cliff tops.

The Committee highlighted serious weaknesses in the advice, approval and legislative processes around coastal development applications in South Australia, and cited the Sceale Bay cases as an example of where there was not a referral process for issues of wildlife impact.

Lisa Baker, resident, local historian and former Streaky Bay Council Member, disapproves of houses in the local sand dunes. 'No way would I give my approval to the sort of things that are happening now.' Grant Hobson

Above right: The world's smallest known sea star, *Parvulastra parvivipara*, lives abundantly in localised spots in the Chain of Bays region. Maria Byrne

Among the research projects to which the inquiry referred was the Coastal Viewscapes Project,[3] initiated by the Department for Environment and Heritage in 2005, which included an internet survey on the importance of coastal visual amenity of more than 2000 respondents and covered 4000 kilometres of the state's coastline. The survey gave the Eyre Peninsula its highest score for scenic value.

South Australia's Urban Development and Planning Minister, Paul Holloway, says he supports the strengthening of planning policy along the state's coastal areas. In regard to the Eyre Peninsula, he says he is currently working with local councils to determine the best course of action towards a plan for the coast – without giving specific dates for its likely adoption.

Meanwhile, as the Friends of Sceale Bay hope for the talk about planning protection for the Chain of Bays to be converted into specific legislation, their community continues to wrestle with the same competing pressures for coastal developments being felt all around Australia.

In recent years there have been approximately 55 Commonwealth government enquiries and reports into coast and marine management, all with recommendations and advice. In this real-time case study, however, the outcomes have much more than just local precedent at stake.

2 Environment, Resources and Development Committee of the Parliament of South Australia (2007). Inquiry into Coastal Development.
3 http://www.environment.sa.gov.au/coasts/viewscapes.html

Focus



Energy superpower – or sustainable energy leader? 2

In this second instalment, **Michael Smith** and **Karlson Hargroves** look at two key planks to Australia becoming an 'energy superpower' through a sustainable energy approach – energy efficiency and the viability of renewables in delivering base-power loads.

Huge wind turbines are a familiar sight off the coast of Denmark, which generates 20 per cent of its electricity from wind. Vestas

Last issue (Part 1, *Ecos* 139) we explored the idea of Australia as a new type of 'energy superpower' capitalising, in today's carbon-constrained world, on technologically savvy, low- or no-carbon energy sources rather than our traditional reliance on non-renewable and greenhouse intensive energy sources, such as coal.

This time, we turn our attention to the role of demand management in supporting a renewable energy based future for Australia, as well as the renewables 'base load fallacy'. This is the argument – often invoked against the adoption of renewables – that renewable energy is intermittent and thus incapable of meeting the 24-hour-a-day, 7-day-a-week background demand for power that is currently largely met by massive, centralised coal-fired power stations.

As we will argue, our base load power requirements may be much higher than they need to be, and could be reduced by better demand management.

Australia's economy and its way of life depend, and will continue to depend, on access to low-cost energy. Added to this are concerns about rising greenhouse gas emissions – and whether the fuels and technologies Australians currently use will be appropriate for our future.

An expansion of nuclear power will take decades to make a significant difference and commercial geo-sequestration is still some years away. But a recent report[1] by Dr Mark Diesendorf shows how Australia could reduce its greenhouse pollution by 30 per cent by 2020. While some experts now say higher cuts will be required, this study was the first to show that 30 per cent could be achieved through a combination of energy efficiency, demand management, decarbonising our transport fleets and expanding renewable energy infrastructure.

In our online Sustainable Energy Solutions Portfolio,[2] the Natural Edge Project (TNEP) has come to a similar conclusion.

Energy efficiency opportunities

Energy efficiency savings are the quickest, easiest and most cost-effective way to

1 Diesendorf M (2007). Paths to a Low Carbon Future: Reducing Australia's Greenhouse Gas Emissions by 30 per cent by 2020. Sustainability Centre. http://www.greenpeace.org/raw/content/australia/resources/reports/climate-change/paths-to-a-low-carbon-future.pdf (Accessed 7 November 2007).

2 Smith M, Hargroves K, Stasinopoulos P, Stephens R, Desha C and Hargroves S (2007). Engineering Sustainable Solutions Program: Sustainable Energy Solutions Portfolio. The Natural Edge Project, Australia. www.naturaledgeproject.net/Sustainable_Energy_Solutions_Portfolio.aspx (Accessed 7 November 2007).



The ABC TV series *Carbon Cops* showed Australians how they could make big cuts to household energy consumption – and energy bills – in a matter of weeks. ABC TV



Energy efficient building design can dramatically reduce energy consumption – the Szencorp office building in Melbourne has a 6-star rating and includes its own photovoltaic energy supply on the roof. Szencorp

reduce greenhouse emissions – not only for industry and government sectors, but for individual Australians who will together determine our direction as a nation in energy consumption. The recent ABC TV series *Carbon Cops*[3] illustrates this point. Six family and student households all reduced their greenhouse gas emissions by over 60 per cent in a matter of weeks, while also halving their energy bills.

However, Australian businesses, government and consumers have had little economic incentive to invest in energy efficiency because of the low cost of Australia's electricity. The National Framework for Energy Efficiency's research shows that energy efficiency opportunities of 30–70 per cent exist for most industry, commercial and residential building sectors in Australia.[4]

These opportunities for energy savings abound. Geoff Andrews, Director of GenesisAuto, says that after 20 years as an energy efficiency consultant 'our experiences have led us to conclude that roughly 50 per cent of the base load electricity usage we find should not be there. For instance, street lighting at night can easily be made 50 per cent more energy efficient'.

'Hospitals run 24 hours, 7 days a week, so it might be reasonable to expect a flat load profile,'[5] says Andrews. 'But then you ask about the areas in a hospital which aren't 24 hours 7 days a week – consulting rooms, admin, laundry, kitchen, x-ray, central sterilising, maintenance, pathology – and more often than not there is still a flat load profile.'

'Also I am still amazed at the portion of base load contributed by storage-based electric water heaters both for commercial and residential buildings. A huge portion of the buildings we see have electric water heaters inconspicuously losing heat supplied with electricity from coal.'

Even higher energy efficiency savings can be achieved in the design of new buildings, factories or appliances. In the last 20 years, engineers using 'whole system design' techniques have found they can cost-effectively achieve energy efficiency improvements of 60 per cent or more in the design of buildings, cars, motor systems, heating and air conditioning systems and computer servers, to name a few.[6]

Economic modelling by the National Framework for Energy Efficiency has shown that if Australia as a whole implemented 50 per cent of available energy efficiency opportunities having a four-year or less payback, this would increase real GDP by AU$1.8 billion and create 9000 new jobs in addition to the environmental benefits.[7]

Improvements in end-use energy efficiency on a large enough scale could save tens of billions in infrastructure costs by delaying for decades the need to build new power stations and extend the electricity grid. Allen Consulting has shown the economic savings from energy efficiency opportunities to be large enough to cover the cost of building new renewable energy infrastructure. In short, a smart combination of energy efficiency and renewable energy would have negligible negative effects on Australia's economic growth.[8]

Solar, wind, biofuels, geothermal, tidal and hydropower now represent a global market of AU$74 billion, which is forecast

3 See ABC TV's *Carbon Cops* at http://www.abc.net.au/tv/carboncops/ (Accessed 7 November 2007).
4 National Framework for Energy Efficiency (NFEE) (2003). Towards a National Framework for Energy Efficiency – Issues and Challenges Discussion Paper. NFEE. http://www.nfee.gov.au/about_nfee.jsp?xcid=64 (Accessed 7 November 2007).
5 Energy demand profiles are graphs plotting peaks and troughs of energy consumption or load over a day or other unit of time. Thus a flat load profile represents a constant level of demand, without significant day or night peaks.
6 Stasinopoulos P, Smith M, Hargroves K and Desha C (2007). Engineering Sustainable Solutions Program: Technical Design Portfolio, Whole System Design Suite. The Natural Edge Project, Australia. www.naturaledgeproject.net/Whole_Systems_Design_Suite.aspx (Accessed 7 November 2007).
7 National Framework for Energy Efficiency (NFEE) (2003). Towards a National Framework for Energy Efficiency – Issues and Challenges Discussion Paper. NFEE. http://www.nfee.gov.au/about_nfee.jsp?xcid=64 (Accessed 7 November 2007).
8 Allen Consulting (2006). Deep Cuts in Greenhouse Gas Emissions: Economic, Social and Environmental Impacts for Australia. Report to Business Roundtable on Climate Change. www.allenconsult.com.au/publications/view.php?id=316

Focus



The US has been forging ahead with solar thermal power. Nevada Solar One, an enormous parabolic solar thermal concentrator array, can generate 64 megawatts – enough to power 40 000 households. Solargenix

to grow fourfold by 2015. By 2003, the global annual output of co-generation and renewable energy surpassed that of nuclear power.

The base load myth

One of the biggest barriers to people accepting the need for greater investment in renewable energy is the perception that renewable energy sources cannot supply base load electricity. Few appear to be aware of the range of sources that have refuted this belief since the early 1980s.[9]

In fact, renewable distributed energy now accounts for one-quarter of California's installed capacity, one-third of Sweden's energy, half of Norway's and three-quarters of Iceland's. Since 2003, Denmark has also generated 20 per cent of its electricity from wind.

Many forms of renewable energy – such as hydro, biomass and geothermal – do not depend on day-to-day weather variations and hence can provide electricity all day, every day. Wind, wave and tidal power can also provide base load electricity when used on a large scale separated by several hundred kilometres and subject to different wind, wave or tidal regimes. The total output of such systems generally varies smoothly; only rarely would such a system be in a situation of no wind, waves or tidal change at any site.

Graham Sinden from Oxford University has investigated the potential contribution of wind, solar, tidal, wave power and other renewable energy sources for electricity in the UK.[10] He concluded that most of the UK's electricity could be generated from renewables, with wind from dispersed sites providing the greatest contribution.[11]

Solar energy can also be stored at low cost as heat in water, rocks or thermo-chemical systems such as ammonia, enabling it to provide electricity 24 hours a day.[12] Solar thermal electric power plants convert solar energy to heat that is used to drive thermal electricity generators. This electricity can supply base load and is just as reliable as base load coal.[13] In fact, solar thermal base load electric systems have been around for 20 years.

Australian scientists have made world-class contributions to solar thermal research over the last 50 years.[14] As was recently reported on ABC TV's *7.30 Report*, two of America's biggest power utilities have unveiled plans for a multi-billion dollar expansion of solar power supply based on technology developed by a former Sydney University professor, David Mills, now based in California. The utilities have confidently predicted that their solar power will soon be providing base load electricity at prices competitive with coal.

Indeed, according to a review by CSIRO scientists for the CRC for Coal in Sustainable Development, some experts now argue that the cost of concentrated solar thermal will become competitive to coal-fired generation when the former's installed capacity reaches 5000 MW worldwide by 2013.[15] As the study's lead author, Dr Louis Wibberley from CSIRO, said: 'What makes solar thermal particularly attractive is the fact that it integrates very well with existing technologies including coal, gas, biomass, photovoltaics and wind power.'

More information:

Smith M, Hargroves K, Stasinopoulos P, Stephens R, Desha C and Hargroves S (2007). Engineering Sustainable Solutions Program: Sustainable Energy Solutions Portfolio. The Natural Edge Project, Australia. www.naturaledgeproject.net/Sustainable_Energy_Solutions_Portfolio.aspx (Accessed 7 November 2007).

Stasinopoulos P, Smith M, Hargroves K and Desha C (2007). Engineering Sustainable Solutions Program: Technical Design Portfolio, Whole System Design Suite. The Natural Edge Project, Australia. www.naturaledgeproject.net/Whole_Systems_Design_Suite.aspx (Accessed 7 November 2007).

ANU Solar Thermal Group, http://engnet.anu.edu.au/DEresearch/solarthermal/pages/pubs.php

Sydney University solar research, www.physics.usyd.edu.au/app/research/solar/clfr.html

Correction: In the first part of 'Energy superpower – or sustainable energy leader' in *Ecos* **139**, p. 20, Barry Jones from the Australian Petroleum Production and Exploration Association was mistakenly identified as the former Labor Party politician with the same name. The error was made by *Ecos* during production.

9 Diesendorf M (2007). *Greenhouse Solutions with Sustainable Energy*. UNSW Press, Sydney.

10 Sinden G (2005). Variability of Wave and Tidal Stream Energy Resources. Oxford University Environmental Change Institute. A summary of the report and further information is available on the Carbon Trust's website at www.carbontrust.co.uk/NR/rdonlyres/EC293061-611D-4BC8-A75C-9F84138184D3/0/variability_uk_marine_energy_resources.pdf (Accessed 7 November 2007).

11 Tickell O (2005). Wave, wind, sun and tide is a powerful mix. *The Guardian*, 12 May 2005. http://www.guardian.co.uk/life/opinion/story/0,,1481539,00.html (Accessed 2 June 2007).

12 Lovegrove K *et al.* (2007). Closed loop thermochemical energy storage system using ammonia. ANU Solar Thermal Energy Research, Canberra. http://engnet.anu.edu.au/DEresearch/solarthermal/high_temp/thermochem/index.php (Accessed 2 June 2007).

13 Lovegrove K *et al.* (2007). Introduction to concentrated solar thermal. ANU Solar Thermal Energy Research, Canberra. http://engnet.anu.edu.au/DEresearch/solarthermal/high_temp/concentrators/basics.php (Accessed 2 June 2007).

14 Lovegrove K and Dennis M (2006). Solar thermal energy systems in Australia. *International Journal of Environmental Studies* **63** (6), 791–802. http://engnet.anu.edu.au/DEresearch/solarthermal/pages/pubs/IJES06.pdf (Accessed 2 June 2007).

15 See 'Solar thermal power warms up'. *Ecos* **129**, 4 (2006). http://www.publish.csiro.au/?act=view_file&file_id=EC129p4b.pdf (Accessed 7 November 2007).



THE NEW CONSERVATION STEWARDS

As Australia's biodiversity faces the double pressures of a changing climate and higher levels of human encroachment, disjoint national parks and reserves simply won't provide enough refuge. **James Woodford** reports on the vital role that private landholders are playing in national conservation plans, and how their efforts might be rewarded.



Biodiversity 'corridors': Gondwana Link, WA, and 'Alps to Atherton' on the east coast.

One of the more common but remarkable Australian animals is the greater glider – a spectacular marsupial with a body the size of a cat, weighing as much as 1.7 kilograms and able to glide up to 100 metres. It is regarded as locally common in a vast band of the east coast of Australia from Mossman, in Queensland, to Daylesford, in Victoria. To watch one of these creatures sailing between tall eucalypts, silhouetted against the night sky, is one of the most glorious nocturnal sights of the Australian bush.

But recently the New South Wales State Government-appointed Scientific Committee made an extraordinary decision: it has listed one group of this presently, relatively common species as an endangered population. It is a decision that highlights how conservation outside national parks is to be a new front in the challenge to secure the nation's biodiversity.

It is also one of the best recent examples of how important conservation on private land is going to be for even those animals we take for granted, let alone endangered species.

Above: Reserve managers Owen Whitaker and Lauren Van Dyke standing on the grassy plateau at Bush Heritage Australia's Scottsdale property, indicating the path for a habitat corridor. Paul Evans

Only 10 per cent of the continent is in conservation reserves. This means that in the face of growing evidence of climate change, ongoing broad-scale land degradation and population growth it is no longer possible to rely on conservation reserves alone.

In his new book *On Borrowed Time* (CSIRO Publishing and Penguin), Australian National University's David Lindenmayer says parks do not protect all of our nation's biodiversity.

'One reason for the failure of our reserves to be comprehensive, adequate and representative is that the area of private land … is nearly three times larger than that of public land,' Lindenmayer says.

Also, Ian Pulsford, the senior NSW government official in charge of establishing a 2800 kilometre wildlife corridor from Victoria to Queensland, says: 'Park boundaries are pretty meaningless in climate change and evolutionary terms.'

But up against a thousand years of English property law, strong rural and development lobbies, where do wildlife managers start to protect habitat on private land?

All three of the existing major mechanisms – volunteer protection by environmentally minded landowners, regulation and incentives – have their limits. And across Australia these mechanisms are currently undergoing a major overhaul. Giant, continental-scale wildlife corridors are being planned and created, and land stewardship programs are being introduced.

Supporting environmental stewards

In May the federal government announced the $50 million Environmental Stewardship Programme for landholders to be paid to protect environmentally valuable areas, initially targeting some of the continent's most endangered ecosystems. These are known officially as areas of 'National Environmental Significance.' The initial funding covers the first four years of a potential 15-year program.

'Land managers will compete on the environmental importance of their proposal, the services to protect the asset, duration of expected benefits and cost,' says a federal government briefing paper. 'They will therefore determine their own costs as part of their competitive bid.'



The greater glider is common in Australia but faces habitat threats. Esther Beaton Wild Pictures

The program won't pay land managers to meet their standard regulatory responsibilities but rather encourages proactive preservation of nationally endangered or vulnerable species and ecological communities, migratory species and wetlands for which Australia has international obligations and natural values associated with world and national heritage.

The first area of significance under the program is the Box-Gum Grassy Woodland – a critically endangered ecological community.

'The Box-Gum Grassy Woodland covers about 405 000 ha through the wheat and sheep belt of Queensland, New South Wales and Victoria and may have about 16 000 land managers within its distribution. It occurs as remnants of varying quality on productive agricultural land and has been reduced to less than 5 per cent of its original extent – much of it needs urgent work. These areas are important habitats for a wide range of plants and animals, including at least 19 rare and threatened species such as superb parrots, regent honeyeaters and squirrel gliders.'



Supporters planting seeds at the Gondwana Link celebration of the purchase of Peniup and Monjebup reserves by Bush Heritage Australia in April 2007. Deborah Badger

The real difficulty with this program will be enforcement and monitoring. Implementation arrangements are still being worked out and, based on other stewardship programs run by state governments, are still considered the weakness of land stewardship programs.

In a statement released after the government announced the program, the Australian Conservation Foundation, WWF-Australia and The Wilderness Society said taxpayers need to know that they're getting value for money, 'That they're not paying anyone to do what should be done anyway and that the best available science is being used to target environmental action. Incentives must result in proactive biodiversity conservation on private land, not end up as another production subsidy.' That is the aim.

Manning new relief corridors

Meanwhile the newly listed population of greater gliders is in an area of rapid development within the Eurobodalla Shire, near Moruya on the NSW South Coast, ringed by an impassable moat. The ocean is to their east, the Princes Highway and large tracts of farmland to their west, and estuaries block migration to their north and south.

Almost every week another huge hole is punched into the forest, by the clearing of 'unproductive' rural land for subdivisions. The land may never have been any good for agriculture but it supports a suite of magnificent creatures, including greater gliders.

The listing will force Eurobodalla Shire Council and the state's Department of Environment and Climate Change to draw up plans to try to recover the species. Development applications will likely have to take into account the retention by private landholders of the large gum trees the species depends upon.

Like the greater gliders, more and more native creatures are going to find themselves stranded on islands of habitat – an archipelago of biodiversity, where species are extremely vulnerable to local ecological events and inbreeding. The job of wildlife managers will increasingly revolve around keeping these populations alive until their isolation on private land can be broken.

The difference between the nation having an archipelago of separated conservation reserves and a connected system of land, where biological systems can have a chance of surviving in the long term, depends on getting landholders more involved in better managing their properties for environmental outcomes.

The good news for the Eurobodalla gliders is that the NSW Government, in partnership with groups such as Bush Heritage Australia and Greening Australia, has recently announced it is embarking on the creation of a 2800-kilometre-long biodiversity corridor stretching from the Alps in Victoria to Atherton in Queensland. One of the main 'tributaries' that will flow into this vast corridor is called Kosciuszko to the Coast – when complete it will be a highway for wildlife stretching from the ocean, near Moruya, to the top of Australia. Private land will be critical if the corridor is to secure the long-term future of the greater gliders and other species.

Ian Pulsford, Connectivity Manager with the NSW Department of Conservation and Climate Change, is possibly the first government official charged with the responsibility for connectivity conservation across an entire state. He is heading up the team behind the 'Alps



A view over the cleared expanse of Scottsdale Reserve, a former private property recently purchased by Bush Heritage Australia, and one of a number of properties involved in a biodiversity corridor project.
John Reid

to Atherton' corridor and says every type of conservation mechanism on private land will be used to try to get the project running and to help handle the conservation determination now needed on a national scale.

Voluntary Conservation Agreements, whereby landholders protect special parts of their property in perpetuity, are the highest and most guaranteed form of protection, but there is also biobanking – under which developers pay landholders with high conservation value land to protect areas as compensation for biodiversity loss arising from development – and regulatory frameworks, such as new native vegetation protection laws.

Pulsford says connectivity gives conservation on private land a greater purpose.

'We don't just want postage stamps,' he says. 'One of the problems we have had is that in the past we have collected hundreds of thousands of little specks on the landscape.'

'Often it's going to be about knocking on doors and contacting the people who love their properties, love their wildlife and the bush but haven't even thought about something like this.'

A similar but more community driven example of a large-scale corridor is Western Australia's Gondwana Link,[1] which joins the Stirling Range and the Fitzgerald River national parks, in the south-west of that state, again, joining isolated tracts of remnant habitat across both private and crown holdings.

Professor of Environmental Science at the Australian National University, Brendan Mackey, says the nation is experiencing an 'extinction crisis'.

'We can't turn the continent into a national park,' Mackey says. But, he emphasises that, where it is possible, joining up patches of bush on private land makes a big difference and programs like Alps to Atherton and Gondwana Link are crucial.

In a recent paper he wrote: 'Landscape-wide planning and management is needed to better buffer and link existing protected areas through mechanisms such as creation of protected areas over important intact linkages, whether as national parks or conservation covenants on private land, changes to land management such as through leasehold conditions, or allowing regrowth of native vegetation. In this way, biological permeability can be enhanced at scales commensurate with the likely impacts of global warming.'



View of the Proteaceous Heath Candle Banksia on Yarrabee Reserve with a view of the Stirling Range.
Jiri Lochman/Lochman Transparencies

Successful trials

CSIRO Sustainable Ecosystems' Dr Stefan Hajkowicz points to a program that he and his colleagues have run in conjunction with Queensland Environment Protection Authority as one extremely effective way of protecting conservation values on private land. In March this year, the project asked landowners to tender for payments to protect natural and indigenous cultural values. Twenty-five indicators were used to assess 95 proposed sites. Some of the tenders were for as low as 36 cents a hectare and others as high as $6300 per hectare.

Altogether 70 of the proposed areas were funded. For $2.3 million, 138 000 hectares of privately owned land is now being managed for conservation.

'In terms of bang for buck, this is excellent,' Hajkowicz says. In fact, if the $2 billion available to the Commonwealth's Natural Heritage Trust had been employed in such a scheme, Hajkowicz says, theoretically 78 per cent of Queensland could have been purchased outright.

'If Australia wants to achieve these landscape services we are going to have to pay for them. Then farmers will have an income stream alongside commodities.'

Hajkowicz acknowledges that one weak point in the scheme as it currently stands is monitoring and evaluation. But, he says, by borrowing from the lessons learned overseas it will be increasingly difficult for landholders to avoid their obligations. The other advantage of such a system is that once a breach is detected payments can simply be withheld.

A similar scheme has been developed for Tasmania, called the Tamar Sustainability Index. Once again, farmers and landholders will be asked to tender for funds in return for environmental services that benefit the whole community.

It will be different to the Queensland case, though, as it looks at issues broader than biodiversity and cultural heritage.

Environmental stewardship services can include activities such as improved water quality, removal of weeds and pest animals, enhancing biodiversity, land rehabilitation and maintaining long-term soil productivity for future generations.

Hajkowicz sums up his goal simply: 'As a taxpayer I want to see species like the cassowary not go extinct, and the Great Barrier Reef not go under a pall of sediments. I want to see results.'

More information:
National Environmental Stewardship Programme, www.nrm.gov.au/funding/esp.html

Alps to Atherton Conservation Corridor program, www.murrumbidgeelandcare.asn.au/node/184

Gondwana Link, http://www.gondwanalink.org/

1 de Blas A (2007). Reconnecting country at a landscape scale. *Ecos* 136, 4. http://www.publish.csiro.au/paper/EC136p4.htm

Making sure your home is not an energy sink 3

In this final instalment of his three-part series illuminating energy savings around the home, **Peter Seligman** provides more insights into heating, carbon offsets and alternative energy sources.

This time, we'll look at space heating. In Melbourne you need it, if you don't want to be the bad guy who goes around telling everybody to put on jumpers instead of heating the house. Our house is heated by gas, and occasionally by a wood fire. Space heating, as you can imagine, is one of the big energy users and also a big CO_2 producer.

In the pre-green 'business as usual' scenario, the central heating accounted for about one-quarter of our home's CO_2 production. We were using around 55 000 MJ (megajoules) per year.

Gas is sold in MJ, electricity in kWh (kilowatt-hours). Both MJ and kWh are units of energy. You can convert MJ to tonnes of CO_2 produced by dividing MJ by 16 000. Our central heating unit was producing (55 000/16 000) 3.4 tonnes of CO_2 a year. It was an older type with a pilot light which, I discovered, was using more gas than the cooktop! We replaced the unit with a 5-star model with electronic ignition. At the same time we added insulation to the ceiling. The combined effect is that we are now using about 39 000 MJ per year – a saving of 1 tonne of CO_2 per year.

After the various energy modifications we made (Figure 1), we are producing about one-quarter of the CO_2 that we produced under the 'business as usual' scenario. Overall, the result is quite satisfying.

Of course our 'journey' wasn't cheap, but it was only a fraction of the price of a 4WD, and will last a lot longer. Here's another way of looking at it. If you decided to buy a large 4WD to replace a normal-sized car, your CO_2 production would increase from about 4 tonnes to 6 tonnes a year. For a fraction of the 4WD's cost, you could reduce your emissions around the house from 14 to 3 tonnes per year – a saving of 11 tonnes! Where are your priorities?

What is the energy or environmental cost of energy-saving measures themselves? For example, how can you calculate the environmental or energy cost of a compact fluorescent lamp (CFL) with its many different components and materials?

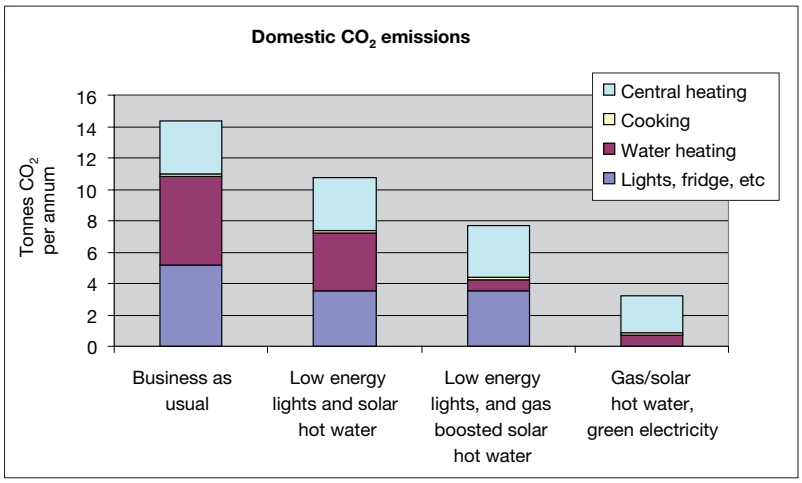


Figure 1: Domestic CO_2 emissions after various energy modifications around the Seligman household.

As far as energy is concerned, if a CFL costs $5, it can only have used $5 worth of energy at an absolute maximum. Otherwise it couldn't be sold for that price. A CFL has the potential to save around 80 watts for 5000 hours, which is 400 kWh. That electricity would cost about $50. So the CFL could save up to 10 times the maximum possible energy cost of its production. So energy wise, it must be worth it.

Carbon offsets

Carbon offset schemes do good, to make up for doing bad. Planting trees is a great example of such schemes. If nothing else, the trees should increase the rainfall and habitat for wildlife – and that's good.

However, you should know that one tree extracts about 60 kg of CO_2 a year from the atmosphere. An average household with average energy use will be putting about 14 tonnes of CO_2 into the atmosphere a

year. The car accounts for another 4 tonnes and each overseas trip another 4. Let's say 20 tonnes a year for the purpose of this discussion.

What is 20 tonnes of CO_2 in tree equivalents? At 60 kg per tree that works out to 20/0.06 = 333. Please plant them! Or use an organisation that will plant and maintain the trees on your behalf – Greenfleet, for example, will plant 17 trees for $40.

The problem is that a carbon offset scheme can't go on indefinitely. If you check the CarbonSMART website (www.carbonsmart.com.au) you will see that part of the contract for people growing timber on their properties is that: 'The carbon will remain on site for at least 100 years after the final trade of that carbon'. Say you lend me $100. After a while you come back and say 'what about my $100?' I reply OK, here's $10 – just put it in the bank at 5 per cent interest and in 50 years it'll be worth $115.

A tree will remove the CO_2 *over its lifetime*. Isn't that the same as the $10 repayment?



Fossil fuel alternative – drilling in the Cooper Basin has initiated strong public interest in emission-free geothermal energy. Geodynamics

Where to from here?

While we have talked about how to reduce our energy use and offset the CO_2 we produce, if we are ever going to make serious inroads into the climate change problem, we will have to do more. What we need are serious, affordable alternatives to old-fashioned coal.

Nuclear energy is a divisive issue, because people in the environmental contingent sit on both sides of the nuclear fence. I won't go into it. The same applies to wind power.

Looked at from a purely economic viewpoint, if we are going to make inroads into the problem, we need to maximise the renewable generation capacity we get for our money. The main alternatives as we know them today are shown in Figure 2. In the cases where there are greenhouse gas emissions, the cost of CO_2 has been added at $60/tonne, to give a total effective cost.

A graph such as this is, of course, highly controversial, and various camps will claim much higher or lower costs depending on their particular bent.

Another alternative is hot rock geothermal energy, mentioned in the previous issue of *Ecos* (**139**, p. 20).

Australia's recoverable hot-rock resources are capable of satisfying current electricity consumption for more than 450 years. The Cooper Basin in South Australia alone could provide emission-free base-load electricity for 70 years. Although this new resource presents some technological challenges, they are solvable, with the help of existing oil-drilling technology.

When compared with nuclear's thorny issues of safe disposal and security against terrorism and accidents, hot rock geothermal seems a very attractive proposition.

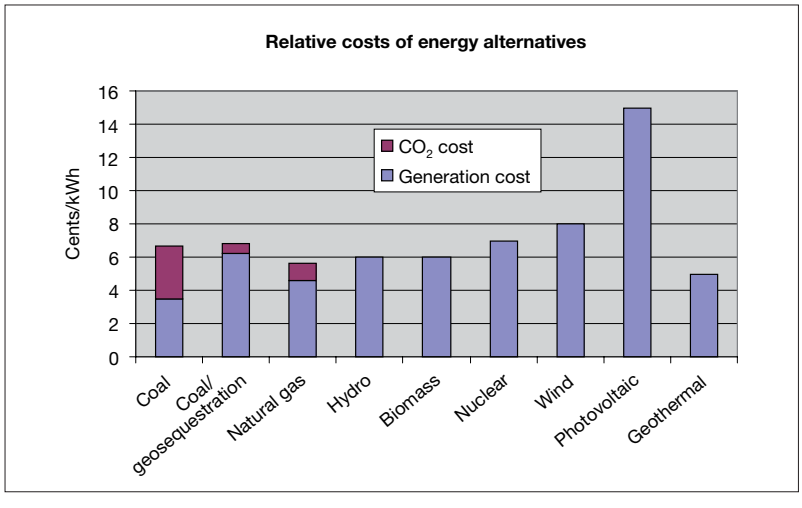


Figure 2: Relative costs of the main energy alternatives available today. The cost of CO_2 emissions has been added to coal and natural gas at $60/tonne, to give a total effective cost.

Our journey

In the first part of this series, I talked about how much energy various domestic appliances use and how we could reduce it. Some surprises included:

- A normal hot shower uses the energy equivalent of 240 light bulbs.
- Leaving a light on every night for a year uses as much energy as driving from Melbourne to Sydney.
- Electrically boosted solar water heating can be worse than gas.
- Fluorescent lights are not necessarily low energy.
- Leaving fluorescent lights on does not save energy.
- Low-voltage downlights use a lot of energy.

After giving you the bad news on the energy consumed by domestic fittings and appliances, we saw how we could do a lot better, by making the right choices and spending a bit of money. By using a combination of tactics, our household managed to get its CO_2 emissions down to one-quarter of its 'business as usual' scenario.

I hope I have alerted you to some of the misconceptions that exist about energy and its use, particularly around the home. My aim was to arm you with information – because as informed citizens, we can all do a better job!

Dr Peter Seligman, a biomedical engineer, was a key member of the team that developed the Cochlear multiple-channel cochlear implant. A focus of his work over the past 24 years has been the development and improvement of speech processors. He is a qualified electrical engineer, holds 25 patents and has been involved in the design of photovoltaic solar energy and solar heating systems.

More information:
CarbonSMART, www.carbonsmart.com.au/pdf/InformationSheet.pdf
Greenfleet, www.greenfleet.com.au

A new ecological 'bible' for the 21st century

World-renowned ecologist Charles Krebs has influenced thousands of ecologists and students over the past three decades through his books *Ecology: The Experimental Analysis of Distribution and Abundance* and *Ecological Methods*, which have become standard texts for tertiary biology and ecology courses.

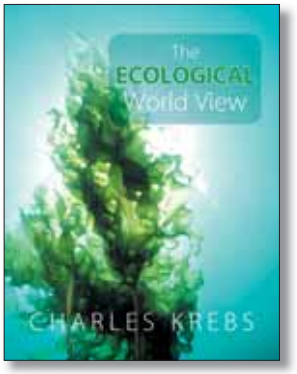
Krebs, a pioneer in experimental ecology, has spent almost 50 years studying changes in mammal populations in Canada and, more recently, Australia. His research contributions include more than 170 published papers.

As a 'semi-retired' professor with the University of British Columbia, Krebs spends six months of each year as a visiting fellow at CSIRO Sustainable Ecosystems in Canberra, where he works with the rodent ecology group studying the control of house mouse outbreaks in south-eastern Australia and rice-field rats in South-East Asia.

Krebs believes the science of ecology is central to solving two of the world's most serious problems: conservation of endangered species and the impact of climate change on ecosystems, both of which he says are more serious in the long run than terrorism.

Krebs' forthcoming 592-page book – *The Ecological World View* – is set to become a new 'bible' for ecology students.

The book is an extremely readable introduction to the general principles of ecology. Topics include geographic and behavioural ecology; predation, competition, infection and parasitism; mutualism and commensalism; biodiversity; disturbance ecology; nutrient recycling; landscape ecology; sustainable fishing; pest control; and conservation of endangered species and ecosystems.



The Ecological World View
Charles Krebs
CSIRO PUBLISHING
2008, Paperback
ISBN: 9780643093805 – AU$79.95
Available from CSIRO PUBLISHING:
www.publish.csiro.au
Local call: 1300 788 000

Published by CSIRO Publishing, the book includes illuminating diagrams and tables, and plenty of photos to vividly illustrate ecological case studies from around the globe, including many from Australia.

In his preface, Krebs writes, 'It is useful to learn something about ecology if you wish to understand the problems humans face in sustaining our environment and protecting the species with which we share the Earth.' This book is an excellent starting point.

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The real word on climate change

Of all the issues facing humanity today, climate change and global warming are probably the most important for all of us to comprehend as clearly and accurately as we can. Given the ever-closing horizons for action to prevent dangerous climate change, it's something we all need to apply ourselves to – myths, fuzzy logic and inaccuracies will just fuel unnecessary conflict and stall global, collaborative efforts to curb the worst of it.

So it's reassuring to know that the word has spread among interested journalists, politicians, concerned citizens and even the scientific community about the award-winning RealClimate website.

RealClimate is a climatology 'commentary site' that has an edge over run-of-the-mill climate change blogs: all nine contributors are climate scientists who take pains to explain current scientific issues, myths and misconceptions about climate and climate change.

The contributors state that the aim



www.realclimate.org

of the site is to provide a context that is sometimes missing in mainstream commentary. The discussion is restricted to scientific topics: the RealClimate crew say they will not get involved in debating the political or economic implications of the science. The prestigious science magazine *Nature*, however, has applauded the RealClimate team for using the blog format to provide quick rebuttals to those who downplay the risk of global warming.

The topics discussed are wide-ranging and include IPCC reports, Arctic and Antarctic climate, climate modelling, hurricanes and other extreme events, global warming, greenhouse gases, glacier retreat, oceans, paleo-climate, responses to contrarians, solar forcing, future climate projections, climate in the media, geo-engineering and sun–earth connections. Apart from the discussion index, there are FAQs, a glossary and news and reviews pages.

If you're new to the site, there is an excellent 'Start here' page, a 'one-stop link for resources that people can use to get up to speed on the issue of climate change'. This page includes links to resources for complete beginners, FAQs for people with a little more understanding of the issue, and further links for those 'informed, but in need of more detail … or more serious discussion'.

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Climate change and oceans: getting back to baselines

Science is starting from scratch when it comes to understanding climate change impacts on Australian marine ecosystems, according to CSIRO's Dr Anthony Richardson who is a member of the team behind the recent report, *Impacts of climate change on Australian marine life.*

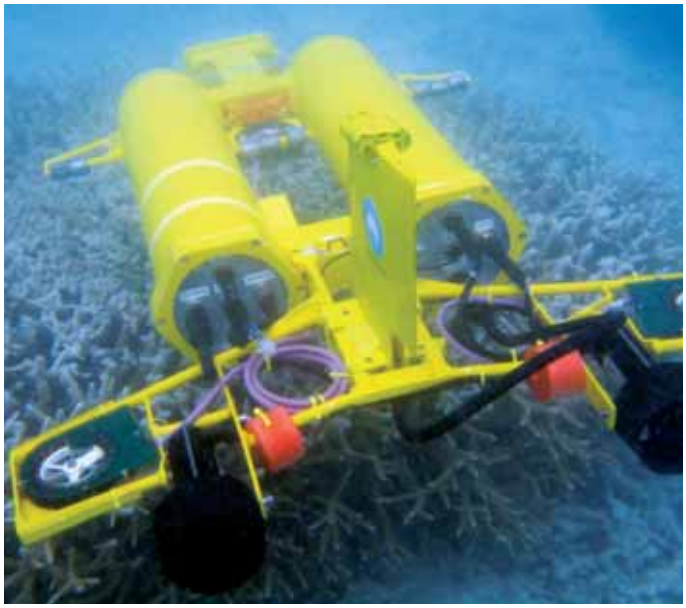
'Almost all the recorded significant changes linked to warming temperatures are from the Northern Hemisphere terrestrial systems, with very few from marine systems and almost none from Australia,' Dr Richardson says.

'You can't translate the impacts of change on land to what might happen to the coasts and oceans because there is greater interconnectivity in marine systems. We have also noted that the timing of life cycle events in marine groups is changing faster than animals and plants on land.'

Dr Richardson and other scientists from the CSIRO Wealth from Oceans National Research Flagship recently completed the key national report for the Australian Greenhouse Office (AGO), which combines the research of climate modellers, ecologists, and fisheries and aquaculture scientists.

The report projects a southward shift in the distribution of species, particularly along the east coast of Australia. The most affected marine groups are likely to be tropical coral reefs, cold water coral reefs, kelps, plankton and species that live on or near the sea floor.

Large ocean circulation patterns are also likely to be affected, with the East Australian Current most at risk. This current carries warm water southwards along the east coast from the tropics to temperate regions. CSIRO already has evidence that this current is strengthening.



Developed by the CSIRO Information and Communication Technology Centre, Starbug is an autonomous, miniature submarine for underwater monitoring and surveying of ecosystems such as the Great Barrier Reef. It is one of the first underwater vehicles in the world designed specifically with vision as the primary sensor for navigation and control. CSIRO

In fact, general circulation models show that waters off south-east Australia are likely to exhibit the greatest warming in the Southern Hemisphere this century.

According to Jo Mummery, Executive Manager of the AGO's Greenhouse Policy Group, the report will help decision-makers determine the risks to Australia's multi-million dollar marine and coastal industries and the health of the marine ecosystem so that they can plan their responses.

Climate projections indicate that temperate fisheries will be more vulnerable than tropical fisheries. Scientists have already seen changes to the distribution and quantity of marine species and communities in areas such as the Tasman Sea.

'One lesson from this summary of research is that information on Australian marine impacts of climate changes is sparse,' says report co-editor, Dr Alistair Hobday. 'To better predict future changes to Australian marine ecosystems, increased observational data coupled with enhanced modelling techniques are needed.'

'The Flagship is continuing to invest in targeted research activities to increase Australia's understanding of climate impacts on our marine ecosystems.'

As part of this coordinated research effort, the Wealth from Oceans Flagship and the Australian Greenhouse Office convened an 'In Hot Water' symposium in Brisbane in November, where international and Australian experts and decision-makers proposed the idea of a 'marine climate impacts report card' for Australia – an annual report that details changes in the physical, chemical and biological environment around Australia, from tropical to polar seas.

CSIRO is also working with the University of Queensland and the Australian Institute of Marine Science to investigate ocean acidification in tropical regions. A research voyage in the Great Barrier Reef will be carried out in July next year to check baseline acidification conditions.

'Without baselines we will not know how the biology of the ocean is responding to climate change,' comments Dr Richardson.

'Research agencies have had strong physical and chemical monitoring programs in the Southern Ocean, but monitoring is more patchy around Australia itself. A comparison internationally shows that we know relatively very little about biological changes in Australia's marine systems compared with other regions.

'Less than 0.3 per cent of the almost 29 000 significant climate change impacts that have been described for the Earth – such as species distributions moving towards the poles or plants flowering earlier with warming – have been found from marine systems.

'This is due to the lack of baseline data, rather than the fact that no changes are occurring – because the few biological changes that have been recorded from marine systems have shown large impacts.'

More information:
Impacts of climate change on Australian marine life, www.greenhouse.gov.au/impacts/publications/marinelife.html

High-level urban monitoring

A consortium of organisations including CSIRO has received funding through a Western Australian advanced computing initiative to develop a high-powered 3D visualisation and digital aerial imagery system to improve the monitoring, planning and management of urban land and water.

The project – 'High performance segmentation and 3D reconstruction using digital aerial images in urban and peri-urban environments' – is a partnership between CSIRO and six Western Australian water and land agencies.[1]

The project will develop detailed multiple-view 3D reconstruction and segmentation algorithms for fine-scale monitoring of urban environments, using the Perth urban and urban fringe areas as a case study.

According to CSIRO, the outcomes of the project will include:

- Improved understanding of trends in urban assets and land uses at an unprecedented scale and accuracy. This will enable the early detection of problems, better evaluation of public programs, and improved land and water management by government and urban water utilities.
- Improved river and wetland foreshore management through the identification of trends in urban vegetation (to link with public intervention programs and broader environmental pressures such as climate change); high-water-use and irrigation efficiencies that can be targeted with water demand management programs; and better estimation of urban storm flows from newly urbanised areas (as a result of changes to impervious surfaces).
- Showcasing the use of advanced computing resources for generating information from terabyte-magnitude data volumes.

The project is funded through iVEC, a joint venture between CSIRO, Central TAFE, Curtin University of Technology, the University of Western Australia and Murdoch University that is supported by the WA Government.

iVEC promotes the use and uptake by industry and government of high-performance computing (HPC), visualisation and large-scale data storage within WA. Application areas include nanotechnology, high-energy physics, medical and mining training, medical research, mining and petroleum, architecture and construction, multimedia and urban planning.



An aerial colour data image of riparian vegetation, houses and the sprinkler distribution impacts on lawn health on an irrigated oval in Perth. CSIRO

1 The partnership involves CSIRO Mathematical and Information Sciences (CMIS), CSIRO Land and Water, the WA Department of Environment and Conservation, the WA Department of Water, the Swan Catchment Council, WA Water Corporation, WA Land Information System (WALIS) and Landgate – the state government's register of land ownership and survey information.

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Feral swamp buffalo continue to invade Kakadu despite successful control attempts aimed at limiting their damage. Parks Australia

No easy solutions to Kakadu's feral animal problem

Cane toads, swamp buffalo, feral pigs … some of the most visible 'wildlife' in World Heritage-listed Kakadu National Park happen to be the rampantly successful progeny of feral animals introduced by European settlers from the 1820s onwards. Controlling them within this ecologically and culturally complex setting is the ongoing challenge.

Today, these animals – not just mammals, but fish, insects and other invertebrates – pose a major threat to the unique ecosystems and native wildlife of Kakadu, Australia's largest national park and a representative microcosm of the Top End's diverse ecosystems.

Unlike other areas of Australia, Kakadu retains most of the plant and animal species thought to have been present in the area 200 years ago – around 1600 native plants, 560 native vertebrates and 10 000 or so insects, most of which are undescribed.

Swamp buffalo have been a persistent threat to the park, despite the Northern Territory's Brucellosis and Tuberculosis Eradication Campaign (BTEC) carried out in the 1980s and 1990s. Although the dense populations in Kakadu were greatly reduced, numbers are again on the rise due to migration of animals from Arnhem Land, outside the BTEC control area.

So, the question could well be asked, what are the prospects for effective and sustained control of buffalo, pigs and other feral animals in Kakadu?

Associate Professor Corey Bradshaw from Charles Darwin University in Darwin is lead author of a recent paper in *Wildlife Research*[1] that reviewed the available published research on feral animal introductions and control attempts in northern Australia from 1950 to 2005.

He says the aim of the paper was to highlight the environmental risks posed by feral animals, the success of previous control efforts, and gaps in knowledge that need to be filled in so that park managers can set up effective control of feral animals 'within complex cross-cultural settings'.

The cultural complexity arises from the fact that Kakadu is managed jointly by Parks Australia and the traditional owners, local Aboriginal people whose ancestors first settled the area around 40 000 years ago. And, when it comes to issues like feral animal control, the views of these traditional owners are not necessarily the same as those of Parks Australia's conservationists.

Aboriginal people in Kakadu, for example, have come to regard buffalo as an important food resource. As a result, park managers have allowed the farming of buffalo inside the park, within a fenced area that has supplied fresh meat to locals. (The future of the 'buffalo farm' is currently under review as some Aboriginal people in different locations say they prefer to maintain their own small herds.)

Aboriginal people in Kakadu, for example, have come to regard buffalo as an important food resource.

Peter Cochrane, Director of National Parks, heads up Parks Australia in the Federal Department of the Environment and Water Resources. He says the Bradshaw review paper highlights the need for 'more systematic and knowledge-driven management of feral species in the park'.

Feral pigs in particular are a major threat to wetlands and monsoon forests, he says, because they breed quickly and require sustained resources and effort to keep under control.

'The issue is not so much lack of information – we have invested considerable effort over the last few years – but the need for additional resources for sustained action to reduce populations of feral animals across the park, and to assess the effectiveness of our actions,' says Cochrane.

Bradshaw and Professor Barry Brook of the University of Adelaide have developed a simple computer-based tool to assist park managers in optimising feral animal culls under the new Feral Animal Management Strategy for Kakadu, which is currently being finalised.

Parks Australia have invested in this new strategy to help its staff and Aboriginal communities work together on feral animal control to reduce habitat damage and costs, generate income, monitor populations and allow for the retention of small populations of buffalo and other 'contentious' feral species.

Still, Bradshaw believes there is a critical gap in our knowledge base – the lack of long-term monitoring data to quantify the impact of animal densities on habitat. Such data, he says, would demonstrate to local people and politicians the value of supporting sustained feral animal control programs that include assessment of operations – with feedback from indigenous landowners – to refine future control plans.

● **Mary-Lou Considine**

More information:
Kakadu National Park Management Plan 2007–2014, www.environment.gov.au/parks/publications/kakadu/pubs/kakadu-mp-2007.pdf

1 Bradshaw CJA, Field IC, Bowman DMJS, Haynes C and Brook BW (2007). Current and future threats from non-indigenous animal species in northern Australia: a spotlight on World Heritage Area Kakadu National Park. *Wildlife Research* **34**, 419–436.

Events Calendar

Security for Development
Brisbane, 29–31 January
www.gdnet.org/middle.php?oid=1220

World Wetlands Day
2 February
www.ramsar.org/wwd/8/wwd2008_intro.htm

Australian and New Zealand Biocontrol Conference
Sydney, 10–13 February
http://anzbc2008.org/

Green Cities 08
Sydney, 10–13 February
www.greencities.org.au

EcoEDGE 2: Sixth in the CityEDGE International Conference Series on Sustainability
Melbourne, 14–16 February
www.cityedge.org.au/



Sustainable Living Festival
Melbourne, 15–17 February
www.slf.org.au/festival

Green City Festival
Adelaide, 17 February
www.greencityfestival.com.au/

Energising Sustainable Communities – Options for our future
3rd International Solar Cities Congress
Adelaide, 17–21 February
www.solarcitiescongress.com.au

Old Forests, New Management
Hobart, 17–21 February
www.cdesign.com.au/oldforests2008/

The Future of the Carbon Market
London, UK, 26–27 February
www.marketforce.eu.com/carbon/

ABARE Outlook 2008
Canberra, 4–5 March
www.abareconomics.com/outlook

World Biofuels Markets Congress
Brussels, Belgium, 12–14 March
www.worldbiofuelsmarkets.com

Population, Peak Oil, Climate Change: Their impact on the Millennium Development Goals
Canberra, 14–15 March
www.population.org.au/events/index.html

World Water Day
22 March
www.un.org/waterforlifedecade/faqs.html#1



Community Development and Ecology: Engaging ecological sustainability through community development
Melbourne, 26–28 March
www.deakin.edu.au/arts/cchr/conferences_seminars.php

Water Efficiency 2008
Surfers Paradise, 30 March–2 April
www.awa.asn.au/Content/NavigationMenu2/Education/NationalInterestEvents/bApr08bWaterEfficiency2008/default.htm

2nd International Salinity Forum
Adelaide, 31 March–3 April
www.internationalsalinityforum.org

11th Annual Asia Power & Energy Congress 2008
Singapore, Republic of Singapore,
31 March–4 April
www.terrapinn.com/2008/asiapower

Water Down Under 2008
Adelaide, 15–17 April
www.waterdownunder2008.com/welcome.htm

True North 2008: Developing Australia's North
Darwin, 29 April–1 May
www.terrapinn.com/2008/north_au/index.stm

Sustainable Energy Conference
Melbourne, 30 April–1 May
Email: alison@bcse.org.au

The Art and Science of Impact Assessment
Perth, 4–10 May
http://iaiaconference.org/files/first%20announcement%20iaia08.pdf

Enviro08
Melbourne, 5–7 May
www.enviroconvention.com.au

16th Australian Weeds Conference: Weed Management 2008
Cairns, 18–22 May
www.16awc.com.au/

International Conference on Waste Engineering and Management
Hong Kong, China, 28–30 May
www.hkie.org.hk/icwem/index.htm

Australia Green
3rd International Residential Green Build & Clean Technology Exhibition & Conference
Sydney, 29–31 May
http://www.grex.com.au/

17th World Hydrogen Energy Conference
Brisbane, 15–19 June
www.whec2008.com

PNGCEA National Conference: Education for sustainability – Do we have a choice?
Port Moresby, Papua New Guinea, 6–9 July
www.acel.org.au/affiliates/pngcea.html

Population Health Congress: A Global World – Practical Action for Health and Well Being
Brisbane, 6–9 July
www.populationhealthcongress.org.au/

17th International Conference on Photochemical Conversion and Storage of Solar Energy
Sydney, 27 July–1 August
www.ips17.com

Coast to Coast 2008
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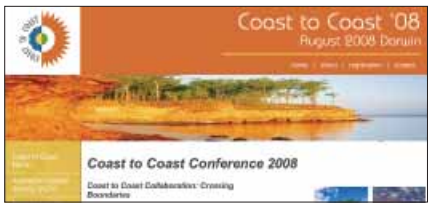

World Sustainable Building Conference
Melbourne, 21–25 September
www.sb08melbourne.com

World Indigenous Peoples' Conference on Education
Melbourne, 7–11 December
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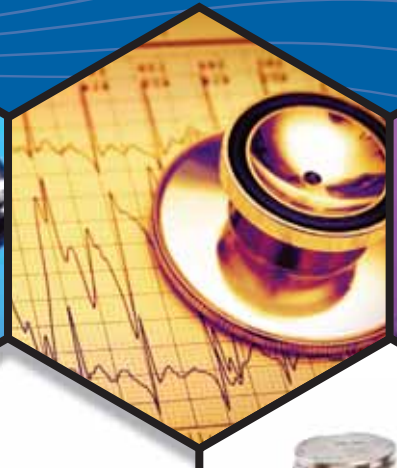







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