

# The Sustainable Campus Program

The University of Sydney's environmental management program is known as the Sustainable Campus Program and is coordinated by the Environmental Strategies Team of Campus Property & Services. The research, learning and teaching aspects of the policy are coordinated by the academic leadership of the University.

## [Sustainable Campus Program Framework 2006](#)

In keeping with its Environmental Policy (2002), the University aims to

- ✎ build constructive partnerships with general and academic staff and students to support environmental innovation and cost savings.
- ✎ lead in defining best environmental practice, and will set its own demanding standards where none exist.

The key environmental challenges facing the University are to:

- provide leadership for environmental sustainability in the University sector
- apply environmental principles to the building and maintenance program
- conserve energy and water
- monitor and reduce greenhouse gas emissions
- minimise waste, environmental risk and pollution
- account for environmental impact when purchasing goods and services
- conserve biodiversity on farms, property and campuses
- promote sustainable transport options for staff and students
- communicate with and involve staff and students in the *SUSTAINABLE CAMPUS PROGRAM*

Current [projects, outcomes and reports](#) from the Environmental Strategies Team.

## ✎ **Strategy: Research, Investment, Action**

### **Senate resolution:**

On 6th March 2006, Senate endorsed the University's strategy as outlined in the paper presented. This noted that funding of \$1 million over three years, corresponding to more than the Green Power premium, would be made available in addition to funds already expended on energy savings and greenhouse gas abatement. This would be used partly for supporting international and collaborative research in sustainable energy, with particular encouragement of linkage grants with industry, and for improvements in the University's Energy Savings Programs.

### **Background**

Unlike other energy consumers a higher education institution such as the University of Sydney holds a unique position in its ability to contribute environmental sustainability and the reduction of green gas emissions. These, we believe, can be achieved through:

1. Taking a lead position in the search for solutions – providing research funding, giving prominence to research projects etc. This is the aspect where universities and governments can really collaborate and directly impact the outcome.
2. 'Teaching by example' - Being an exemplary role model of the management and conservation of energy and the environment through our management practices

The University will contribute \$1 million to research within the University which represents a 12.5 % equivalent green power premium for three (3) years: 2006-2008.

The key contribution the University will make to green power is better invested in research as well as extending current management practices of the University environment funded by Infrastructure budget. Continuing investment in this way leads to the realisation of tangible outcomes in regard to renewable energy sources, energy conservation and energy efficiency.

The aim of investing in research is to speed up the wide scale introduction of renewable energy resources. It is also important that there is adequate Federal and State government funding for research and development in this area. The emergence of green power schemes has taken the pressure off governments to increase funding by giving the impression that effective action in support of renewable energy resources already exists. Unlike other environmental issues where governments take action, the energy debate seems to be off limits. Instead of relying on consumers, there needs to be the establishment of renewable energy portfolios standards whereby electricity companies are required to purchase a minimum specified percentage of their electricity from renewable sources ([www.greenhouse.gov.au](http://www.greenhouse.gov.au)). Moreover investing in Green Power does little to discourage wasteful patterns of electricity consumption.

The University's research is also placing a priority on areas in Australia to which the electricity grid does not extend, approximately 75% of Australia's land of surface. In these areas, residents are forced to rely primarily on diesel fuel, both expensive and environmentally-polluting. Wind power, energy generators and solar energy systems are capable of providing the vast bulk of electricity supplies needed in these areas and minimising the future use of diesel fuel. Green electricity schemes ([www.greenpower.gov.au](http://www.greenpower.gov.au)) do nothing to further this goal. The cost of wind energy is highly competitive with fossil fuel alternatives and yet we are being forced to pay a premium for it. The University believes that rather than paying a green power premium, it is better to fund research that brings about inexpensive alternatives.

As a large consumer of energy, the University is not shirking its responsibility to the environment and challenges industry and government to match its investment in research.

## Investment in Environmental Sustainability

The University is investing in a number of strategies and programs to ensure the development and conservation of renewable energy. The following provides a brief overview of each of these:

### **Integrated Sustainability Analysis Group (ISA)<sup>1</sup>:**

- conducts leading-edge research addressing environmental and broader sustainability issues
  - different energy *technologies* (Lenzen 1999; Dey and Lenzen 2000; Lenzen and Dey 2000; Lenzen and Munksgaard 2001; Lenzen and Wachsmann 2004; Lenzen and Collins 1997; Lenzen, Turner et al. 1999; Dey, Mills et al. 2000; Buie, Dey et al. 2003; Buie, Monger et al. 2003; Dey and Buie 2003; Dey, Proschek et al. 2003; Buie, McCann et al. 2004; Dey 2004; Royne and Dey 2004; Royne, Dey et al. 2004; Royne, Dey et al. 2005); and
  - energy *consumption* by populations and economies (Lenzen 1998b; a; 1999b; Lenzen and Dey 2002; Lenzen and Treloar 2002; Wood et al. 2003; Lenzen et al. 2004).
- fosters multi-disciplinary thinking in research, teaching and training and applications
- conducts successful outreach to government, industry and the community;
- has earned international recognition for excellence in sustainability research and its applications. See [www.isa.org.usyd.edu.au/publications/index.shtml](http://www.isa.org.usyd.edu.au/publications/index.shtml) for summary of Research.

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<sup>1</sup> Provided by Prof. B. Hesketh. PVC- CST

### **Australian Centre for Environmental Law (ACEL)**

The objectives of the Centre, briefly, are to encourage, promote and support innovative and important scholarship including teaching, research, consultancy and public interest advocacy in all areas of environmental law and policy. These objectives are pursued within the University of Sydney, with other related Centres in Australia and overseas, with the legal profession, and with the wider community both in Australia and internationally.

### **Institute of Wildlife Research (IWR)**

A consortium of concerned scientists, mostly from the Sydney region, with a diversity of backgrounds and skills, from the plant and animal sciences. It runs conservation and research projects in a wide variety of locations both within Australia and overseas. It also has a large number of postgraduate students, who further strengthen its research program.

### **Centre for Heavy Metal Research (CHMR)**

CHMR's three main research areas, relating to health, industry and environment are extremely relevant to the well being of our society. Importantly, the Centre is the first of its kind to be established in Australia and will ensure that the University of Sydney and its associates are at the forefront of heavy metal research throughout the SE Asia region.

### **Centre for Research on Ecological Impacts of Coastal Cities (CREICC)**

The Centre for Research on Ecological Impacts of Coastal Cities is doing the necessary research to improve our understanding of the ecological processes affected by coastal changes so that we can make better progress in our protection and use of coastal habitats.

### **Centre for Salinity Assessment and Management (CSAM)**

CSAM aims to increase our understanding and improve the transmission of knowledge and management of the processes of dryland, irrigation and urban salinity.

### **Centre for Risk, Environment and Systems Technology and Analysis (CRESTA) & Co-operative Research Centre for Sustainable Minerals Processing**

Promotes the sustainable competitive advantage of Australian business and industry, environmental decision making, LCA and value chain analysis.

### **Centre for Rural Sustainability (CRS)**

The Centre aims to foster research & development in rural sustainability for staff within and without the University of Sydney, nationally and internationally and to provide facilities, networks and other support.

### **Cooperative Research Centres (CRCs)**

The University is also part of the following CRCs that have a large focus on sustainability:

- Cooperative Research Centre for Biological Control of Pest Animals
- Cooperative Research Centre for Construction Innovation
- Cooperative Research Centre for Australian Cotton
- Cooperative Research Centre for Sustainable Rice Production

### ***Warren Centre for Advanced Engineering***

They currently have a major project investigating how transport in major cities can be integrated with urban planning and communications focussing particularly on new, developing technologies and intelligent systems to better manage the movement of people and freight. Also a current project is determining appropriate standardised indicators to measure water quality for catchment areas, across different types of catchments.

### ***Australian Mekong Research Centre***

The AMRC is a resource centre that promotes research, discussion and debate on development and environment issues in the Mekong Region. The Centre focuses on the role Australia plays in the

region as a near neighbour, donor and major trading partner. The Centre is a focal point for information, dialogue and activities in support of an equitable and sustainable development path for the Region.

## **& Action through Energy Related Research Projects**

In 2006, there are over 20 projects being conducted and funded by the University and other grant agencies. They include:

1. New Approach to Photonic Interferometry with Applications in Sensing
2. Simulation and Analysis of Buoyant Horizontal Jets
3. Enhancement of Heat Transfer by Stimulated Transition to Turbulence in Natural Convection Boundary Layers on Heated Walls
4. An investigation into fountains interacting with both free surface and solid boundaries
5. Stability and transition of natural convection boundary layers
6. Mechanical characterisations of carbon nanotubes
7. Modelling of nitric oxides and carbon monoxide emissions from bagasse-fired boilers
8. Mechanics models for designing stitched composite laminated structures
9. Process systems for distributed chemical manufacturing
10. Carbon surface oxides: the key to understanding the chemical rate of carbon combustion
11. Highly compacted heat exchanges and related research
12. Thermal processing of CCA-treated timbers for energy recovery and environmental protection: a focus on metals' deportment and management of metals'
13. Characteristics of chlorophyll d-binding protein complexes: in assembly of light-harvesting complexes
14. Theoretical modelling of chemical systems, with applications to excited states, intermolecular interactions, bacterial photosynthesis and molecular electronics
15. Molecular Electronics: from electron transfer through photosynthesis towards functional nano devices
16. Frontier technologies, prototypes and strategic positioning for the international radio telescope, the square kilometre array
17. Design Of Practical Passive Cooling Radiators Utilising Spectrally Selective Covers And Surfaces
18. Development of advanced solar water heaters
19. The surface science of vacuum glazing
20. Project 2 - Low Temperature Passivation Technology for Silicon cells
21. Project 5 - Cooling Devices for Concentrating PV
22. Environmentally green energy management system for future homes/offices [Hong Kong]
23. Energy Storage and Release in Solar Active Regions

### Summary of Sustainable Energy Research at the University of Sydney, January 2006

Department	Groups/Themes	Main contacts	Personnel	Research areas
Physics	Integrated Sustainability Analysis Group <a href="http://www.isa.org.usyd.edu.au">http://www.isa.org.usyd.edu.au</a>	Dr Manfred Lenzen Dr Joy Murray Dr Christopher Dey	5 staff, 1 PhD student	<ol style="list-style-type: none"> <li>1. quantitative triple bottom line analysis using a comprehensive whole of economy model</li> <li>2. energy (and emissions) analysis (see reference list next page)</li> <li>3. life cycle and ecological footprint analysis</li> <li>4. industrial sector and company sustainability reporting</li> <li>5. national environmental accounting</li> </ol>
Chemistry	Green Chemistry/Processes <a href="http://www.chem.usyd.edu.au/~thomas">http://www.chem.usyd.edu.au/~thomas</a>	Prof Thomas Maschmeyer  A/Prof Anthony F Masters	4 staff, 6 Postdocs, 6 PhD and 2 hons students, 1 Technician	<ol style="list-style-type: none"> <li>1. fundamental chemical research on production and storage of hydrogen (as an energy carrier)</li> <li>2. development of new catalysts and functional materials</li> <li>3. biomass to biofuels conversion</li> <li>4. scaling issues for these processes enabling high throughput, including process intensification</li> </ol>
Physics	Energy Group <a href="http://www.physics.usyd.edu.au/app/research/solar/index.html">http://www.physics.usyd.edu.au/app/research/solar/index.html</a>	Dr Matt Boreland (solar) Dr Nelson Ng (windows) Dr N. Ekins-Daukes (PV)	About 5 staff and 2 p/g students	<ol style="list-style-type: none"> <li>1. solar selective surfaces: design, fabrication and testing</li> <li>2. large scale coating technology</li> <li>3. vacuum glazing technology</li> <li>4. photovoltaics and related conversion technology</li> </ol>
Chemical Engineering	Renewable energy, the hydrogen economy, low emissions fossil technology <a href="http://www.chem.eng.usyd.edu.au/about_us/research/energy_environment.html">www.chem.eng.usyd.edu.au/about_us/research/energy_environment.html</a>	Dr Andrew Harris (Director Laboratory for Sustainable Technology)  Professor Brian Haynes  A/Professor Tim Langrish	Laboratory: director, 7 PhD students, plus 6 part time students/staff  Others too	<ol style="list-style-type: none"> <li>1. hydrogen production from waste materials</li> <li>2. solar thermal gasification of biomass and wastes</li> <li>3. biomass combustion, gasification and pyrolysis</li> <li>4. process intensification of fluidisation reactors</li> <li>5. development of advanced porous burner technologies</li> <li>6. cogeneration (Rolf Prince)</li> <li>7. development of zero emission coal technology</li> </ol>

Chemical Engineering	Environmental Systems Analysis <a href="http://www.chem.eng.usyd.edu.au/about_us/research/energy_environment.html">www.chem.eng.usyd.edu.au/about_us/research/energy_environment.html</a>	Professor Jim Petrie Dr Brett Cohen	About 3 staff and about 5 PhD students	<ol style="list-style-type: none"> <li>1. greening the process engineering industries</li> <li>2. disposal of waste and residuals</li> <li>3. systems analysis of the above, including societal concerns</li> <li>4. simulation and optimization using tools such as Life Cycle Assessment and Industrial Ecology.</li> <li>5. multi-criteria decision analysis tools</li> </ol>
Civil Engineering	Environmental Fluids <a href="http://www.civil.usyd.edu.au/environmental/index.shtml">http://www.civil.usyd.edu.au/environmental/index.shtml</a>	Dr Dong-Sheng Jeng	About 9 staff and about 4 p/g students	<ol style="list-style-type: none"> <li>1. fluid structure modelling</li> <li>2. ocean wave energy conversion</li> <li>3. wind farm micro-siting analysis</li> <li>4. tidal current energy conversion</li> </ol>
Aerospace Mechanical & Mechatronic Engineering	Combustion research <a href="http://www.aeromech.usyd.edu.au/research/energy/">http://www.aeromech.usyd.edu.au/research/energy/</a>	Prof Robert Bilger	3 staff (recent activity is hard to assess)	<ol style="list-style-type: none"> <li>1. fundamentals of combustion research in many applications</li> <li>2. computational fluid mechanics</li> <li>3. fire safety engineering</li> </ol>