University of Wollongong

Power to the People
Building Sustainable Jobs in the Illawarra

A Report for the South Coast Labour Council
March 2009

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13 February, 2009

Green Jobs Illawarra – Outline Brief

South Coast Labour Council – Regional Employment Strategy

This is a brief of the regional green jobs strategy for consideration at the meeting of the multi-disciplinary group at the University of Wollongong. Naturally the Labour Council welcomes suggestions about the strategy and its implementation.

Objective

To develop, promote and implement a regional strategy to create jobs in the green and other emerging industries which will form one (important) part of the region's response to the expected job losses caused by the global economic crisis.

Plan

Phase 1.

Assemble multi-disciplinary team of experts (eg economists, human geographers, sociologists, educationalists, planners and regional statisticians) with the view to developing a plan for the Green Jobs strategy. This will include:

- overview and summary of relevant Green Jobs programs and strategies regionally, nationally and internationally through literature searches etc.

- brief overview of the Illawarra's industrial profile and labour market including key assets and infrastructure such as the R&D capacity of the University, steel and related heavy industry which may support a Green Jobs strategy.

- Identify and critically examine specific sectors of the New Economy that the region may be able to promote, develop and/or cultivate from R&D through to manufacture and application, including: power generation (sea/ wind/solar), water harvesting and conservation, transportation, energy-conserving retro-fitting, green housing construction and ecological town planning. Explore the Green Street concept as a practical proposal for innovative research and application in sustainable town planning and development.

- Identify funding options for further developing and for implementing the regional green jobs strategy and the release of a blueprint which will including the public sector finance eg. Local/State/Federal Government grants, particularly for initial research component; and indentify and involve private sector bodies with an interest and experience in the emerging industries.

Phase 2.

- Present plan as developed in Phase 1 to SCLC reference group and then to a meeting of regional stakeholders including government, business and industry and key institutions such as the University and TAFE.

- Obtain support for the advancement of the strategy, the establishment of a multi-stakeholder steering committee and endorsement from stakeholders for public/private funding for the finalization of the blueprint and its implementation.

- Steering Committee oversees and evaluates the effectiveness of strategy and makes any changes necessary for the implementation of specific initiatives.

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are needed to see this picture.

Getting Real in the Global Market

Amidst growing economic uncertainty, the Illawarra is seeking new ways to generate employment particularly for its young people whose unemployment rates have been alarmingly high for some time and are rapidly deteriorating. In this regard, renewable energy and energy self-sufficiency are not pipe dreams. These technologies are already existing and can be deployed on a large scale. Renewable energy combined with the smart use of energy can deliver one third of the world's energy needs by 2035 and half by 2050 using already available technologies. World demand for renewable energy is predicted to grow by 82 per cent from 1990-2020.

Water and energy-efficient technologies and design methods have been well tested and proven in Australia. As will become clear below, decades of technological progress have seen renewable water and energy technologies such as wind turbines, solar photovoltaic panels, biomass power plants, ocean power generation, solar thermal collectors and water conservation technologies move steadily into the mainstream.

The common feature of these technologies is that they rely on virtually inexhaustible natural sources for their "fuel" and produce little or no greenhouse gases. (Currently 80 per cent of global energy is provided by fossil fuels). Some of these technologies are already price competitive. Their cost will further improve as they develop technically, as the price of fossil fuels continues to rise and as their saving of carbon dioxide emissions is given a monetary value. Rising demand, the increase in fossil fuel prices and the costs of carbon-dioxide emissions will nearly double the price of electricity by 2050.

The global market for renewable energy is growing dramatically; already in 2006 its turnover was US$38 billion, 26 per cent more than the previous year. In recent years, the wind and solar power industries have shown that it is possible to maintain a growth rate of 30-35per cent, with solar predicted to grow by 25 per cent per annum in the next two decades. As a proportion of global venture capital investment, green industries are up from just 1.6 per cent of total investment in 2003 to 11 per cent in 2008. And in terms of value, global venture capital investment in these industries in 2008 is expected to exceed the record $US3 billion invested in 2007, having reached $US2.2 billion in the first six months of 2008. The value of sales from wind, solar and geothermal power and biofuels will continue to grow to as much as $US1 trillion a year by 2030, according to investment analysts. Accordingly, the costs of solar photovoltaics are expected to experience a steep decline from a high starting point, and wind and tidal electricity generation are expected to experience significant cost reductions. Good wind sites, solar thermal technologies and solar heating are now economically viable or will be in six or so years, although solar photovoltaics may continue to require some subsidisation such as the $8,000 currently available from the Federal Government, soon to be replaced by the Solar Credits Program. Unless the domestic system is producing more power than it needs, cost remains a problem at about 70 cents per kilowatt-hour compared to around 15 cents from conventional fossil fuel sources. However, the Federal Industry Minister under the previous government had predicted price rises of 20-30 per cent in the next decade. If the real cost of fossil fuel power was paid, the *Wall Street Journal* suggests that this too would add on 13-24 cents.

Energy consumption per capita in Australia is amongst the highest in the world. It has more than doubled over the last thirty years. In 2007, the Government set a new Mandatory Renewable Energy Target of 20 per cent of Australia's electricity supply to be from renewable sources by 2020. Meeting this target requires the greater use of renewable energy sources for heating, cooling and power. Most of these technologies will be able to reduce their investments costs by between 30-60 per cent of current levels by 2020. And the market is huge. In 2007, there were already 725,000 consumers of electricity derived from sun, wind, hydro, and waste. But even though wind, solar and other renewable energy technologies have experienced double-digit market growth for the last decade, at the moment, they count for only about 3 per cent of the energy of the OECD Pacific nations (Australia, New Zealand, Japan and South Korea) and less than 2 per cent of Australia's. Renewable energy sources are expected to consolidate at a high level between 2030 and 2050, and by 2050 the majority of energy will be produced by them with wind and solar power making up 60 per cent of electricity generation in the OECD Pacific nations.

Wind Power

The global wind resource is enormous, capable of generating more electricity than the entire world consumes. Over the last 20 years, wind energy has become the world's fastest growing energy source. It currently accounts for 20 per cent of electricity generation in Denmark, 9 per cent in Spain and 7 per cent in Germany. The wind industry has a growth rate of 20-30 per cent per annum. Global wind generation quadrupled between 2000 and 2006 and is set to double by 2010. In Europe, wind is cost-competitive with coal- and gas-fired power. More than 150,000 people are employed in the industry globally.

Wind turbines are produced by a sophisticated mass production industry employing a technology that is efficient, cost effective and quick to install. Turbine sizes range from a few kilowatts, suitable for backyard usage, to over 3 megawatts, with the largest turbines reaching more than 100m in height. The total structure can be as high as a 40-storey building. One large wind turbine can produce enough electricity for 5,000 households. Wind turbines can be operated not just in the windiest coastal areas but also inland. In Denmark, a wind park built in 2002 uses 80 turbines to produce enough electricity for a city with a population of 150,000, seven times the population of Kiama. The people of the Hepburn Shire in Victoria have obtained a planning permit for a wind park of two 2-megawatt wind turbines that will meet the energy requirements of 2,300 homes. The park will be in operation in 2010. The project is funded by public subscription and with the support of the Victorian government. The Hepburn Community Wind Park is Australia's first community-owned wind farm.

Modern wind technology is available for a range of sites - low and high wind speeds, desert and even arctic climates. European wind farms operate with high availability, are generally well integrated with the environment and accepted by the public. More than 80,000 wind turbines now operate in over 50 countries around the world. The German market is the largest, but there has also been impressive growth in Spain, Denmark, India and the United States.

Under the Mandatory Renewable Energy Target scheme, Australia's manufacturing industry has already gained some experience in wind technology. VESTAS established a nacelle assembly plant in Burnie, Tasmania (unfortunately now closed). The nacelle is the enclosure at the top of the support tower containing the gearbox, generator, transformer, yaw and pitch control mechanisms – currently made mostly from imported components. Turbine tower manufacturer, Haywards Engineering, also established facilities in Tasmania. In Victoria, Keppel Prince established a manufacturing plant for wind towers and components and until recently, a blade manufacturing plant was based in Portland. South Australia hosts the major steel fabrication company, Air-Ride Technologies. Pacific Hydro initially focused on hydro projects but diversified into wind energy in 2001. Currently the firm has three hydro energy and ten wind energy projects in Australia, either operational or in development. Their largest operational wind project is the Challicum Hills wind farm in eastern Victoria which generates enough electricity to power 25,000 homes. A group representing seven local councils along the NSW coast south from Wollongong is investigating the establishment of a wind power industry. Current energy output from this industry in NSW represents only 1per cent of requirements, compared to 11per cent in South Australia.

Solar Power

Solar technologies that produce heat are collectively referred to as solar thermal technologies. Technologies that directly convert sunlight into electricity are known as photovoltaics.

Photovoltaic Technology

Photovoltaic (PV) technology involves the generation of electricity from light. This process uses a semiconductor material which can be adapted to release electrons, the negatively charged particles that form the basis of electricity. The most common semiconductor material used in photovoltaic cells is silicon, generally extracted from sand. All PV cells have at least two layers of such semiconductors, one positively charged and one negatively charged. When light shines on the semiconductor, the electric field across the junction between these two layers causes electricity to flow. The greater the intensity of the light, the greater the flow of electricity. A photovoltaic system does not need bright sunlight in order to operate. In central Europe a surface area of approximately 27 square metres produces power sufficient for an energy-conscious household.

The most popular type of solar PV system for homes is grid connected. Connection to the local electricity network allows any excess power produced in the home or business to be sold to a power utility or shared with others in the community. Electricity is then imported from the network outside daylight hours. An inverter is used to convert the DC power produced by the system to AC power for running normal electrical equipment.

A grid-supported system is also popular and can be connected to the local electricity network as well as to a back-up battery. Any excess solar electricity produced after the battery has been charged is then sold to or shared with the network. This system is ideal for use in areas of unreliable power supply.

Off-grid power is growing in popularity. These are stand-alone systems completely independent of the grid. The system is connected to a battery via a charge controller, which stores the electricity generated and acts as the main power supply. An inverter can be used to provide AC power, enabling the use of normal appliances. Typical off-grid applications are small solar home systems covering basic electricity needs or solar mini-grids, which are larger solar electricity systems providing electricity for several households.

Solar systems can be combined with other sources of power - a biomass generator, a wind turbine or a water turbine. A hybrid system can be grid connected, stand alone or grid supported.

Solar Thermal Power

Solar thermal power also called concentrating solar power (CSP) plants, produce electricity by concentrating solar radiation and converting it to high temperature steam or gas to drive a turbine or motor engine. Large mirrors concentrate sunlight into a single line or point. The heat created there is used to generate steam. This hot, highly pressurised steam is used to power turbines which generate electricity. Much of Australia receives an annual average of more than 9 hours sunshine per day, CSP plants can guarantee large shares of electricity production. A land area of only 250 square kilometres could accommodate enough solar collectors to meet Australia's entire energy needs.

Four main elements are required for CSP: a concentrator, a receiver, some form of transfer medium or storage, and power conversion. The parabolic trough is the most mature technology, with many plants connected to the Southern California grid since the 1980s and more than 2 million square metres of parabolic trough collectors installed worldwide. Trough-shaped mirror reflectors concentrate sunlight on to thermally efficient receiver tubes in the trough. A thermal transfer fluid, such as synthetic thermal oil, is circulated in these tubes. Heated to approximately 400 degrees centigrade by the concentrated sun's rays, this oil is then pumped through a series of heat exchangers to produce superheated steam. The steam is converted to electrical energy in a conventional steam-turbine generator.

Two other forms of CSP plants, the solar tower (or central receiver) and the parabolic dish are being developed in Australia, Spain and the USA. The CSIRO's National Solar Energy Centre has developed a prototype solar tower which is capable of reaching more than 1000 degrees centigrade. It is constructed from components already mass-produced in Australia.

Solar thermal technologies on the market now are efficient and highly reliable, providing energy for a wide range of applications - from domestic hot water and space heating in residential and commercial buildings to swimming pool heating, solar-assisted cooling, industrial process heat and the desalination of drinking water.
Domestic hot water production is the most common application. Depending on the conditions and the system's configuration, more than 90 per cent of a building's hot water requirements can be provided by solar energy. Larger systems can additionally cover a substantial part of the energy needed for space heating. Progress is being made with the integration of solar technology into the building fabric itself. Integrated solar panels and 'paint on' films are expected within five years.

There are two main types of solar thermal technology:
• flat panel: This is basically a box with a glass cover which sits on the roof like a skylight. Inside is a series of copper tubes with copper fins attached. The entire structure is coated in a black substance designed to capture the sun's rays. These rays heat up a water and antifreeze mixture which circulates from the collector down to the building's boiler.
• vacuum tubes: The absorber inside the vacuum tube absorbs radiation from the sun and heats up the fluid inside. Additional radiation is picked up from the reflector behind the tubes. Whatever the angle of the sun, the round shape of the vacuum tube allows it to reach the absorber. Even on a cloudy day, when the light is coming from many angles at once, the vacuum tube collector can still be effective.

Solar chillers use thermal energy to produce cooling and/or dehumidify the air in a similar way to a refrigerator or conventional air-conditioning. This application is well-suited to solar thermal energy, as the demand for cooling is often greatest when there is most sunshine. Solar cooling has been successfully demonstrated and large-scale use can be expected in the near future.

In conclusion the immediate solar energy future comprises:
solar hot water; photovoltaic panels on homes and buildings supplying distributed energy; small parabolic troughs or advanced evacuated tubes supplying medium temperature heat for industrial, hospital, mining and agricultural processes, and for absorption chillers (such as in shopping centres and commercial buildings); large solar-thermal power plants, either in hybrid or stand-alone form, for bulk supply of solar electricity to the grid for distribution to all users.

In the Bega Valley, south of Wollongong, a solar farm feasibility study is being undertaken to make recommendations on the most appropriate type, cost, size and technology for the production of a solar farm capable of powering 1,000 homes. This study aims to give communities a practical example of how to get a 1-2 megawatt solar farm off the ground.

Self-Sustaining Homes and Office Buildings

Becoming more sustainable involves the whole of the community. It means new industries, lower impact sources of energy production and modes of transport, and changes in home construction, water usage and ways of living.

In this respect, Australia is lagging behind. The privatisation of the electricity industry in most of Australia since the 1990s has lead to a reduction in investment in maintenance and improvement. $78 billion will be required to 2050 if output is to meet demand. Current generation efficiency from coal-fired power stations which supply most of Australia's electricity is only about 30-40 per cent; that is, up to 60 per cent of the fuel is wasted. Six per cent more ($660 billion worth per year) is lost through the 44,000 kms of transmission networks. Only 37 per cent of the power generated arrives at the point of consumption. The average efficiency of domestic appliances is 40 per cent. Households, then, usefully use only 22 per cent of the energy generated by this system.

It is now eminently feasible for most households to be energy self-sufficient most of the time only requiring a grid connection to sell surplus energy back to the grid, and to draw it back down for the occasional times when self-generation is inadequate.

For example, the self-sufficient house built by Michael Mobbs in the Chippendale suburb of Sydney cost $48,000 in 1996 to achieve water and solar self-sustainability and sewage reticulation. The house is unreliant on mains water, sewage and electricity. The cost of achieving self-sustainability is dropping steadily and a decade later to build similar features into a house in Brisbane cost $37,000, supported by a $3,600 rebate.

It is more efficient and cheaper to build these self-sustaining features into greenfield sites. VicUrban and six Victorian builders are developing the $1billion+ Auroa, an 8,000 home sustainable community for 25,000 people. Its focus is on passive conservation features: appropriate positioning, insulation, airflow, and water sensitive design. Ecovillage, currently underway in Currumbin, Queensland is more ambitious. This 144-lot subdivision incorporates centralised wastewater treatment and recycling, rainwater tanks, composting toilets, solar energy and hot water systems and passive solar design. The village itself produces fifty percent of its energy. The 64 lot Camden Haven Eco Village currently underway in Port Macquarie is to be independent of mains water and sewage, will recycle all water and will generate most of its own energy. In recognition of these savings, the local Council has reduced developer contributions from $28,000 to $8,000 per lot, a $1.2 million upfront saving.

Self-sustainability is also a feature of existing commercial buildings. Perhaps the best-known commercial development is the Melbourne City Council's CH2 (Council House Two) in Little Collins St, a ten storey office building with street front retail shops. It is equipped with sustainable water, sewage, solar power and water heating, climate control and passive ventilation systems. It is expected to reduce its electricity consumption by 85 per cent, gas consumption by 87 per cent and mains water supply by 72 per cent. A two storey commercial development, Rockcote, in Nerang, Queensland meets 100per cent of its energy and water requirements on site, and uses no fossil fuels or poisonous chemicals to achieve self-reliance. Its owners say that they have been "inundated with offers at record prices". Its initially sceptical developers report "We do not have an energy crisis, nor a water crisis, what we have is a crisis of logic". Developers are increasingly aware that energy efficiency ratings systems and carbon footprint and reliability of supply concerns will steadily attract buyers to their properties.

Building self-sustaining homes and offices fits well with other interconnected elements of sustainability: better public transport; cycle-ways; alternative energy generation projects; shared community resources (community gardens, book, tool and toy libraries); and low-impact, 'grass-roots' industries, from new cultural festivals to creative industries such as surfboard designing, music-making, writing, film-making. The multitude of needs – of households and businesses for sustainable services, new construction materials, transport modes, new niche industries – are an opportunity to create diverse and more sustainable jobs for the future. The young people of the Illawarra – who will be implicated the most in whatever jobs are created in the region – are valued and valuable assets. Small steps have already been taken such as the 'sustainable Illawarra' initiatives, and new research on household sustainability and new grass-roots industries in the Illawarra, undertaken by researchers at the University of Wollongong. But more needs to be done.

Water Usage

Hydrologists predict a national urban water shortage by 2030 yet there exist already a range of options for more sustainable systems. The Wollongong Recycled Water Plant is one of these. It is one of the largest plants of its type in Australia, treating wastewater from three coastal sewage treatment plants and producing up to 20 million litres of high quality recycled water each day for BlueScope Steel.

Treated urban water of a suitable quality is also used for cooling in air conditioners and cooling towers, fire protection, toilet and urinal flushing, commercial car washing and laundries, dust suppression, water features and street cleaning. Some of these processes are suitable both for new buildings and for retrofitting existing buildings, such as rainwater collection, greywater use and sewer mining.

60L, a multi-storey commercial sustainable building in Carlton, Victoria, uses 10 percent of the mains water that would be used by an equivalent 'traditional' building. It harvests, filters and sterilises water for use in taps and showers; and treats its grey water and sewage and reuses them for flushing toilets and landscape irrigation. The building provides 3375 square metres of lettable space on four floors and cost only 5 per cent more than a building of comparable standard. All of these technologies are available for homes both for retrofitting and for new construction.

Heating, Cooling, Retrofitting

Water heating and space heating/cooling accounts for two-thirds of the energy used in Australian homes. Long term projections of home energy use are that it will continue to increase by about 2 per cent per year. Insulation and thermal design can dramatically reduce heat loss and cut heating and cooling costs. Energy demand for heating and cooling in existing buildings can be reduced on average by 30-50 per cent. More than one third of Australian homes have no insulation at all. Heat (or cool air in summer) leaks through gaps and poor insulating materials, and valuable energy is lost. This results both in a waste of energy resources and to unnecessary costs for home owners and tenants. Typical weak points are window panes and frames and thin walls below windows. In new buildings energy usage can be reduced by 90-95 per cent using widely available and competitive technology and design.

Water Energy

Tidal Power
Tidal power is harnessed by constructing a dam or barrage across an estuary or bay with a tidal range of at least 5 metres. Gates in the dam allow the incoming tide to build up in a basin behind it. The gates then close so that when the tide flows out, the water can be channelled through turbines to generate electricity. Tidal dams have been built across estuaries in France, Canada and China but high costs and environmental objections to the effect on estuarial habitats have limited the technology's further expansion.

Wave and Tidal Stream Power
In wave power generation, a structure interacts with the incoming waves, converting this energy to electricity through a hydraulic, mechanical or pneumatic power take-off system. The structure is kept in position by a mooring system or placed directly on the seabed/seashore. Power is transmitted to the seabed by a flexible submerged electrical cable and to shore by a sub-sea cable.

Wave power converters can be made up from connected groups of smaller - generator units or several mechanical or hydraulically interconnected modules can supply a single larger turbine generator. The large waves needed to make the technology more cost-effective are mostly found at great distances from the shore, however, requiring costly sub-sea cables to transmit the power. The converters themselves also take up large amounts of space. Wave power can be located in the ocean without much visual intrusion. There is no commercially leading technology on wave power conversion at present. Different systems are being developed at sea for prototype testing. Most development work has been carried out in the UK and some is taking place in Wollongong. The coastal waters of Eden, south of Wollongong City, have been identified as ideal for a wave farm.

Jobs

Current research and development activities in the renewable energy sector are estimated to involve 20,000 jobs across the country. A business as usual (BAU) scenario suggests that this number will increase to 150,000 by 2030. However, a dedicated green jobs (DGJ) program in this sector could result in 375,000 jobs by 2030.

Energy efficiency ratings and retrofits for buildings, household appliances and industrial production systems, including the fitting of thermal insulation to existing buildings and the measurement and rating of appliances according to their energy use are estimated to involve 5, 000 jobs currently. BAU estimates are for 15,000 jobs by 2030. A DGJ program could raise this to 75,000 jobs.

Sustainable water systems such as moisture sensors and smart information technology for agricultural producers, currently provide 25,000 jobs. BAU estimates: 30,000 jobs by 2030. DGJ estimates: 66,000 jobs.

Green buildings which will radically reduce the use of energy, materials and water, and the output of emissions, of new buildings through their design, construction and operational phases, currently employ 23, 000. BAU estimates: 77,000 by 2030. DGJ estimates: 230,000.

Waste processing and recycling technologies and facilities provide employment for 39, 000. BAU estimates: 42,000 by 2030. DGJ estimates: 45,000.

With the appropriate mix of government policies and incentives, and private sector investment, the existing workforce in these industries could increase nearly sevenfold, or by an additional 499,000 jobs by 2030.

The ACTU/ACF survey of 1994 showed green employment grew by 81 per cent between 1988 and 1993 in the 361 employers surveyed. The Sustainable Energy Industry Surveys of 2000 and 2002 also indicated continuing upward trends in growth rates and employment. Direct Australia-wide employment in the sustainable energy industry was 26,685 in 2000/2001 and this had risen to 29,290 in the following year. The Green Skills Inc 2002 Western Australian study reported that general businesses they had surveyed had experienced job losses of between 66 per cent and 90 per cent between 1997 and 2002. In sharp contrast was the significant growth in environmental jobs. Between 1997 and 2002 employment had increased by 64 per cent in the environmental sector. According to the CSIRO, the creation of at least 33,000 new jobs in manufacturing, 77,000 jobs in transport, and 145,000 jobs in construction over ten years is achievable across the country.

A lot of the new jobs in the environmental sector comprise environmental officers, project/business managers, scientists and laboratory assistants, research and development analysts and marketers. Jobs in renewable energy and energy efficiency are in manufacturing, installation, maintenance and servicing, operations, transport and delivery of goods, sales, research and design. Building retrofitting, wind power and solar power jobs are in the same areas of employment that people already work in today. For example, constructing wind farms creates jobs for sheet metal workers, machinists and truck drivers, among many others. Increasing the energy efficiency of buildings through retrofitting relies, among others, on roofers, insulators and building inspectors.

Building Retrofitting:
electricians, heating/air-conditioning installers, carpenters, construction equipment operators, roofers, insulation workers, builders' labourers, truck drivers, construction managers, building inspectors

Wind Power:
environmental engineers, iron and steel workers, millwrights, sheet metal workers, machinists, electrical equipment assemblers, construction equipment operators, truck drivers, production managers, production supervisors

Solar Power:
electrical engineers, electricians, industrial machinery mechanics, welders, metal fabricators, electrical equipment assemblers, construction equipment operators, installation workers, labourers, construction managers

Jobs in the Illawarra

Unemployment in the Illawarra (Wollongong, Shellharbour, Kiama) has remained well above the NSW and national rate for many years. In January 2009, the Illawarra unemployment rate was 7.6 per cent compared to the national rate of 5.3 per cent. In September 2008, the youth unemployment rate increased from 15.2 to 17.5 per cent.

Most parts of the Illawarra have lost jobs due to the restructuring of the dairy industry, public sector reorganisation, the BHP-Billiton merger, the float of the steel division and the closure of coal mines. Manufacturing has been affected by both organisational and technical change. The region is now facing new structural pressures arising from the economic downturn associated with the global financial crisis and the need to reduce greenhouse gases. These factors particularly will affect the industrial base of the region causing some firms to close down and/or move offshore, as has been the case very recently with the King Gee and Bonds factory closures at the cost of nearly three hundred jobs. However, a 'greener' economic structure offers opportunities to strengthen existing and develop new industries and services based on the existing skills base.

However the Illawarra is better positioned than most other regions in Australia in its skills base. It is positively advantaged in the proportion of its workforce that is engaged in manufacturing, metals and machinery and equipment production, construction and transport, most of which have exhibited declining employment in recent years, and all of which will benefit from a sharper focus on sustainable growth.

Skills Development and Training

Skills development and training are a critical part of creating these jobs. Investment in new training programs and apprenticeships in energy efficiency, water management and renewable energy technologies is essential to attract and retain investment in these take-off industries. While some talk about a skills revolution, green skills will actually occur in very traditional sectors such as, as seen above, those abundant already in the Illawarra. In the construction sector, for example building workers will do things very differently in order to build more energy efficient buildings. Skills change in turn will make demands on training delivery. Restructuring the energy system to decentralised and renewable systems will require appropriate know-how and skills to be more accessible. The TAFE sector in particular has been quick to respond to these needs.

Green Plumbers
Working with the community, local government and manufacturers, GreenPlumbers, developed by the Master Plumbers and Mechanical Services Association, improves plumbers' skills and knowledge about the environmental effects of their work. The programs train plumbers to provide their customers with up to date information and advice on the latest technology and energy saving appliances; environmental impacts of plumbing services, appliances and household practices; and energy and water cost savings. The retrained plumbers are successful in helping householders to reduce greenhouse gas emissions from heating and cooling appliances and hot water systems and to reduce their running costs.

EcoSmart Electricians
The National Electrical and Communications Association, the peak body for electrical contractors in Australia, has developed a program to train licensed electricians nationally in energy-efficient and environmentally-friendly electrical products, technology and installations.

EcoSmart Electricians provide residential, commercial and industrial customers with the best options for energy efficiency that reduce the amount of electricity consumed and also the cost. The nationally recognized training course consists of four compulsory modules: Energy management; Lighting; Solar generation systems; Heating and Cooling; Pumps, fans and motors, and a Continuing Development component to provide plumbers with ongoing knowledge of emerging technologies and products that directly concern energy efficiency.

Education for Sustainability in the Illawarra
Creating sustainable jobs in the Illawarra is an ideal opportunity for developing Education for Sustainability (EfS). Education for Sustainability (or Learning for Sustainability) was developed to achieve environmentally sustainable, economic development. According to UNESCO:

> The central global vision of the program is: ... to integrate the principles, values, and practices of sustainable development into

> all aspects of education and learning. This educational effort will encourage changes in behaviour that will create a more sustainable future in terms of environmental integrity, economic viability, and a just society for present and future generations. (UNESCO 2005)

EfS looks at how paid work, jobs and work-related learning can enhance "old' trades and occupations. Current training often mirrors outdated demarcations and also perpetuates a separation between sustainable work and industry and ecological sustainability. Recent EfS initiatives in NSW include the collaborative skillecosystem approach to industry development and training. TAFE NSW Riverina Institute has led a project dealing with skills in waste water and water resource management. This demonstration project involved collaboration with several co-operative research centres including Waste Management and Pollution Control, Water Quality and Treatment, Catchment Hydrology and Freshwater Ecology. It explored the skills needed in wetland design, development and maintenance and sought to stimulate local industry.

Promoting EfS and developing sustainable jobs in the Illawarra can make connections between training providers, industry and the community. A sustainable jobs project in the Illawarra could bring together a broad consortium of trainers and develop new relationships between training providers, employment, industry, developers and the environment. Exploring new training and career pathways would be a crucial part of building sustainable jobs in the Illawarra.

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We apologise to these authors for not following the usual citation procedures in the report itself.

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