

## **Developing and using green skills for the transition to a low carbon economy**

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*One of the strategies being advocated in response to climate change is the need to transition to a low carbon economy. Current projections show that within this transition, new jobs will be created, some eliminated and most others subjected to change. This article reports findings from interviews with a selection of twenty participants who are involved in the formation and/or deployment of green skills. The participants were asked about their perceptions of (1) how jobs are changing in the transition to a green economy (2) how are adult learners developing and using green skills, and (3) what are some of the main drivers and blockers to the development and use of green skills. The data are presented as vignettes from various positions of supply and demand within the emerging green economy. The findings of this study report that the organisations and the training providers are motivated to develop and/or deploy green jobs and green skills for a range of different reasons. These include the making of a favourable business case, environmental beliefs about conserving the finite resources of the planet and, for health and wellbeing reasons. Some blockers that have been identified are the initial capital outlay for any changes, and the need to address some inconsistencies that arise over time in the financial arrangements when trying to work*

*out the business case. This has led the designers and contractors working in renewable energy to call for a level playing field with those who provide and utilise finite resources and non-renewable energy. Overall transition to a low carbon and green economy is shown to be supported and occurring with some limited success. However there is a need for further larger scale research into this area of skill formation and deployment.*

**Keywords:** Skills for sustainability, green skills, low carbon economy, green jobs, education for sustainability

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## **Introduction**

The evidential basis for climate change has been well summarised by the Intergovernmental Panel on Climate Change (IPCC 2007 & 2013), with social scientists like Giddens (2011), Lever-Tracey (2011) and Baer (2013), providing analysis and discussion of the politics. One of the main strategies advocated for in the debates around mitigation of climate change is to drastically reduce Greenhouse Gas Emissions by transitioning to a low carbon economy. This transition has substantial implications for adult learning in contemporary society. This study reports on stakeholder perceptions of the development and deployment of green skills and greener jobs as they are arising across Victoria, Australia, in the context of transitioning to a low carbon economy.

Aligning with the bigger picture of transition to a low carbon economy is the argument for the introduction of a green economy. This is explained as consisting of greener jobs and green jobs utilise green skills. Green jobs are consistently described in the literature as having two components. First they are decent, fair and meaningful jobs, and second, they are jobs which reduce negative environmental impact. Subsequently, green jobs are defined by the International Labour Organisation (ILO) as jobs that '*help reduce negative environmental impact ultimately leading to environmentally, economically and socially sustainable enterprises and economies. More precisely green jobs are decent jobs that, (1) Reduce consumption of energy and raw materials; (2) Limit greenhouse gas emissions; (3) Minimize waste and pollution; and (4) Protect and restore ecosystems*, (2012: 1).

Hatfield-Dodds, Turner, Schandl & Doss (2008) report that there are significant gaps in our knowledge and that there is a distinct lack of evidence around skill requirements in what they call 'the green collar economy'. This current study stands to address this lack of evidence as it reports the qualitative findings from interviews with a selection of twenty industry and community stakeholders ascertaining their perceptions of emerging green jobs and the formation and deployment of green skills across the state of Victoria, Australia.

The design of the study is guided by the argument from Green (2013) that the understanding of skills within the labour market involves appreciation of two interacting markets, one that is centred on skill deployment (demand) and the other on skill formation (supply). This study investigates stakeholder perceptions of (1) how jobs are changing in the transition to a green economy; (2) how adult learners are developing and using green skills, and (3) what some of the main drivers and blockers are to the development and use of green skills.

### **Setting the scene**

In 2007, the Australian government developed its strategy paper in response to the United Nations (UN) Decade of Education for Sustainable Development (DESD) titled '*Caring for our future*'. This was followed up two years later with the release of the National Action Plan called '*Living sustainably*'. In this, Education for Sustainability (EfS) is acknowledged as equipping all people with the knowledge, skills and understanding needed to make decisions based upon consideration of environmental, social and economic implications.

The principles for EfS are explained as, transformation and change; education for all and lifelong learning; systems thinking; envisioning a better future; critical thinking and reflection; participation and partnerships for change (pg. 9). Provision of EfS is reported in the National Action Plan as being variously facilitated through government departments, educational institutions at all levels, industry bodies, community groups, zoos, botanical gardens, national parks and environmental education centres. Strategy 2 in '*Living sustainably*' argues for the need to 'reorient education systems to sustainability'. The strategy covers all levels of education and it states, 'the Australian government is committed to using education as a critical resource to

prepare Australia for the emerging social, economic and environmental challenges of the 21st century. A transformative approach to education is needed, involving whole of institution engagement, innovative teaching and learning and changes to curricula', (pg. 21). This article reports on how adult work-related learning programs are, and need to be re-orientated to support the transition to a low carbon and green economy.

For many, climate change has become the flagship issue within sustainability (National Sustainability Council 2013). Part of the response to climate change in Australia has included efforts to align the Vocational Education and Training (VET) sector to assist individuals and businesses to contribute towards a sustainable low carbon economy. In 2009, the federal government released the National VET Sector Sustainability Policy and Action Plan. This detailed four key areas to concentrate effort. These were, develop a workforce with skills for sustainability, provide VET programs that support skill formation for sustainability, encourage the development of values and attitudes amongst VET leaders and educators that are conducive to sustainability, and reduce the carbon footprint of VET institutions.

This was closely followed by the Council of Australian Governments (COAG) when they ratified the implementation of the national Green Skills Agreement (GSA) in December 2009. The four aims of the GSA directly relate to aspects of the VET sector and subsequently form part of the policy context for this study. These goals have been summarised as, the development of national standards, upskilling the VET workforce, the revision of Training Packages, and supporting the transition of vulnerable workers. As yet though no public systematic evaluation of the effectiveness of what has occurred through this initiative has been conducted.

## **Literature Review**

Fien and Guevara (2013) explain that the concept of the green economy replaces the previous concept of 'sustainable development' and that it has four interconnected and mutually dependent goals. These are, increasing economic growth; reducing unemployment; increasing social inclusion and equity; and reducing greenhouse gas emissions. Aligning to these goals are three dimensions which they describe as, (1) 'widespread respect for, and costing of, ecosystem services so that

air, water, soils, forests, crops, minerals and energy resources that we consume reflect a policy shift of living off the interest on natural capital rather than widespread borrowing of our share from future generations, thereby mortgaging the future of human society' (p. 256); (2) the dematerialisation of agriculture and industrial processes, reducing rates of depletion, waste and pollution and making use of energy more efficient. Resources that have been considered free or as externalities will be factored in and needing to be more appropriately costed. This is expected to have substantial effect on existing markets; and (3) an insistence on social equity and inclusion through clean and decent jobs, (p. 257).

The initial joint research report published by the Australian Conservation Foundation & Australian Council of Trade Unions (1994) raised the difficulty that occurs when attempting to define green jobs. This is made clearer through the following questions, is, 'a recycling plant that emits air pollution a green jobs? Is an aluminium smelter that dramatically reduces waste sent to landfill, yet contributes large emissions of greenhouse gases, a producer of green jobs; and are all jobs in ecotourism green jobs? (These questions are cited in Thomas, Sandri & Hegarty 2010). Such considerations inevitably lead to an awareness of there being 'shades of green' possible (UNEP 2008). Ehmcke, Philipson and Kold-Christensen (2009) have taken up the challenge of the shades of green argument and proposed a means for explaining jobs that are on a spectrum of green jobs through a simple set of categories that depicts work role and degrees of environmental sustainability.

Fien & Guevara (2013) suggests that it may be more helpful to think in terms of green skills for jobs; and that these might be classified as, (1) existing jobs will all require additional skill sets related to ethics and sustainability, others talk about the need to include environmental awareness. (2) New jobs being created within existing industries, such as might be found in building and construction. (3) New and expanded industries using existing technical skills along with ethical understanding and new technical skills, the renewable energy industry being an example. (4) New and expanded industries using new occupations, though these are still being developed (Fien & Guevara 2013: 259).

In a recent report by the Green Jobs Initiative, *Working towards sustainable development: opportunities for decent work and social inclusion in a green economy*, (ILO 2012), the case is made that current development models based on fossil fuels are unsustainable. They estimate that if this model continues then productivity will begin to decline and by 2030 will be 2.4% lower than today and by 2050 this will be 7.2% lower than at present (ILO 2012:vii). In contrast they report that worldwide growth in the renewable energy sector is some 21% per annum and currently employs around 5 million workers worldwide - this is double what it was just a few years ago.

The transition to a low carbon economy across Europe is being driven in part by the potential for jobs growth in much needed recovering national economies and the policy agenda of the European Union. The latter has instigated a 20-20 strategy. This policy setting involves aiming to reduce greenhouse gas emissions by 20% compared to 1990 levels; increase the share of renewable energy sources in the final energy consumption by 20% and reduce energy use relative to projected 2020 levels by 20% (CEDEFOP 2013). These targets need to be backed up with new technologies, new work practices, and the appropriate range of knowledge and skills. Such strategies clearly implicate and provide an impetus for appropriately aligned learning across all the sectors of education with the vocational and adult fields of learning at the forefront. Accordingly, groups like CEDEFOP, the European Union, the ILO and the OECD often include the argument for ongoing lifelong learning.

Many reports from such sources as the International Labour Organisation (ILO 2012; 2011a; 2011b; 2011c), the Organisation for Economic Co-operation and Development (OECD 2009; Kauffmann & Less 2010), The European Union and Commission (European Commission 2011), CEDEFOP (2010), and national governments such as Germany (Jaeger et al 2011), France (Mathou 2010), the USA (Mass, Moss, Hopkins & Ross 2010), Brazil (Cruz Caruso 2010) and the United Kingdom (BIS 2010; Charalambous, Lawrie & Beadle 2010; Pye & Evans 2012), are all arguing that increasing investment in the green economy including the development of the necessary sustainability related knowledge and skills have the potential to increase employment, provide decent jobs and maintain the environment and increase social capital.

Rafferty and Yu (2010) in the Australian component to the 21 country study '*Skills for green jobs*' explain that 'existing shifts in employment within the Australian economy, namely the decline in the manufacturing and agricultural sectors, are likely to be exacerbated by the transition to a carbon-constrained economy' (p.12). Over the last twenty-five years while professional health care workers have driven employment in the service sector up from 45% to 55%, manufacturing has decreased from 17% to 10%, and agriculture has declined from 6% to 3%. Such declines in existing job markets has led the Australian Conservation Foundation (ACF) and the Australian Council of Trade Unions (ACTU), to continue their research partnership in this field (1996) and identify six green industries which they believe are well positioned to flourish (2008, p.19). These are renewable energy, energy efficiency, sustainable water systems, biomaterials, green buildings, and waste and recycling. These reports estimate that the work in these emerging jobs will easily outnumber those that are disappearing.

Likewise, the Climate Institute (2011, p.1) estimates that some 34,000 new jobs could be created in Australia by 2030. Such estimates stand alongside the modelling provided by Hatfield-Dodds, Turner, Schandl and Doss, (2008), who optimistically explain the potential for jobs growth in these emerging green collar jobs. These researchers emphasise that it is possible to develop well designed policies to combine economic growth with a reduction of the environmental footprint; and that, transition to sustainability would have little to no impact on national employment. Their best case modelling shows the possibility of increasing jobs by 2.5 – 3 million jobs in the next two decades. Even those industries that are expecting to experience a high environmental impact could increase employment by some 10% in the next decade. They model that as many as 230,000 – 340,000 new jobs could be created across the transport, construction, agriculture, manufacturing and mining industries, (Hatfield-Dodds, Turner, Schandl and Doss, 2008).

In 2010 the federal government Department of Education, Employment and Workplace Relations (DEEWR) published their survey of 1932 employers from across eight different industries and found that just under half (48%) said they had been affected in some ways by environmental or sustainability issues in the past 12 months, with

almost the same amount (47%) saying that they had not been affected at all. When asked about the next 3 to 5 years, 38% of employers thought that there would be a skills impact in the next three to five years. The skills most commonly identified by these employers were knowledge and understanding of compliance issues; general environmental awareness skills; specialist environmental skills; and knowledge about green products and processes. Many were concerned about the rising costs associated with compliance and in terms of appropriately aligned training explained their preference for in-house or private providers and short non-award programs.

Meanwhile, ClimateWorks Australia an independent, research-based, non-profit organisation, has conducted research across five industries, identifying a pathway and strategies to operationalise the transition to a low carbon economy (ClimateWorks Australia 2010). This study describes 54 opportunities where immediate action could be taken. Importantly, they explain that 22% of emissions reduction opportunities would be immediately profitable to implement. Yet despite this, when ClimateWorks Australia (2013) released its subsequent Progress report it showed that, 'while the Australian economy has grown strongly over the last decade, emissions have remained stable' (pg.3). This research suggests that if recent levels of emission reduction activities are sustained it would reduce by half the expected growth in emissions to 2019 – 2020. Consequently, this would provide only 40% of the 5% minimum 2020 emissions reduction target. This seems very slow progress and even a reluctance to implement the necessary changes even when these changes are shown to be profitable. The progress report denotes that even the very modest targets that have been set by the federal government may only just be reached by 2020.

## **Methodology**

The study collected data through individual interviews with twenty key informants, namely industry and community representatives, considered to be stakeholders and participants in the green economy. All the interviews were semi-structured and were digitally recorded and fully transcribed. The data from the interviews were thematically analysed. All participation was voluntary and occurred following active and informed consent as per the Ethics approval.

The main limitation of this study is that it is small scale and therefore the findings have limited reliability, as they are indicative but certainly not definitive of the current situation. The purpose of this qualitative research was to provide insight into the nature of the current situation rather than provide extensive empirical proof.

### *The participants*

The twenty interviewees are representatives of the following industry and community organisations as set out in the Table below.

<b>Stakeholder representative</b>	<b>Position in organisation</b>
Transport & Logistics company	Senior Training Manager
Medium and small sized businesses	2 x CEO/Owners
Community Education Centre	Senior Education Officer
Energy Generation Company	Senior Manager
Local Council	Sustainability Officer
Renewable Energy Retail Supplier/Installers	3 x CEOs
Sustainability Victoria	Senior Manager
Master Plumbers Association	Senior Manager; Senior Trainer
TAFE Green Skills Centre	Program Co-ordinator, Senior Educator
Regional Development Centre	Regional Manager; Senior Consultant, Retired Bank Manager, President of APEX
Service Industry Association	Employer Representative
Industry Skills Council	Senior Manager

The perspectives of these representatives are presented below as vignettes.

### *The vignettes*

**Transport and logistics:** this large transport and logistics company employs 20,000 people with an annual turnover of \$3billion. In 2006 this company set out to reduce their carbon emissions. Audits showed that the company had an 80/20 energy usage, 80% being diesel fuel

and 20% being electricity. The managers in the company set a target for reducing their emissions by 15% in 2010 and 50% in 2015. As of the end of the last financial year they had achieved a 36% reduction.

Three enterprise specific training programs have been developed and implemented by this company. The first is 'Eco-drive' which is aimed at reducing the 80% of the total energy usage related to diesel fuel. In this training program drivers work one on one with one of the company's thirty training staff to develop more efficient driving practices. The drivers learn how to reduce fuel consumption, reduce Co<sub>2</sub> emissions, minimise driver stress, increase road safety, reduce vehicle operating costs, reduce vehicle wear and tear, and minimise breakdowns. The resources for this program are interactive and online, and in a portable CD format. These learning resources have been translated into six languages and over 1000 employees have successfully completed the program.

The second program is for shopfloor employees. It is called 'site-habits' and is aimed at the other energy component that expends 20% of the total energy usage on electricity. This training program is more informal and site and role specific. The learning occurs through lunch box meetings where the employees are asked to consider how they might change an aspect of their electricity usage.

The third program came about after the manager for sustainability returned from completing a Sustainability course at Cambridge University in the UK. As a result the company designed a program that involves learning the basic science behind global warming and climate change. This program is aimed at middle management and has been designed and developed in-house. The program is called a Certificate in Environment and Climate Change. This program has ten modules and is conducted over two days of intense training.

The company explicitly recognises the risks and damages associated with global warming and climate change. It chooses to emphasise and explain the science. The average education level of their employees is Year 10 level. With this in mind, the company employed an artist to produce a wall chart/poster to explain the seriousness of the science behind climate change. These are displayed throughout the workplaces.

The size of the company with its 20,000 employees benefits from ‘economies of scale’ that allow the training resources to be professionally prepared using video production and online multimedia resources. Energy use costs the company \$100m/per annum therefore a reduction of this running cost translates into a very large cost saving for the company. In exceeding their targets by the third year, the training and emphasis on sustainability is not costing but instead is adding to the company’s profitability.

**Timbertown Community Resource Centre:** Timbertown has a population of 1400 and two large sawmills are the main employers. The town is situated on the outskirts of the Latrobe Valley. The Community Resource Centre conducted a survey to identify issues through which they could build programs and engage the community in community-orientated adult learning. As a result of these consultations, The Timbertown Community Resource Centre ran three sustainability orientated programs.

The first of these was ‘the changeover program’. This involved changing over almost 5645 incandescent light globes and some 300 water wise showerheads. The second sustainability program run by the centre was a program to become Green Loans Home Assessors. One of the educators at the Timbertown Community Resource Centre trained as a trainer and assessor for this program. She brought these skills back and ran the program through the centre. They trained up 312 local people as Green Loans Home Assessors in the next four months. Unfortunately the government initiative was discontinued so the 312 graduates did not find employment, though many found they could turn their skills to the benefit of the community.

The third program involved ‘flying the flag for sustainability’. This program consisted of three stages. In the first stage, each householder/participant had to choose to implement six strategies from a list of 30 possibilities. The options were meant to be cheap or even free to implement and involved strategies around water, waste, energy, disability access, and safety. The six implemented options had to be verified by a home assessor but once confirmed the householder was provided with their white flag. The flag was attached to the roofline of the house indicating the achievement. According to the Centre’s

co-ordinator most householders went beyond what was required and implemented up to twenty of these options – because they saved money and resources, and were cheap to implement.

Stage two had a further range of slightly more complex options considered to be promoting a higher commitment to environmental sustainable. Householders had to implement six strategies from the range of options at the middle level. Once assessed by a home assessor, a blue flag was attached to their roofline. Similarly, stage three involved implementing four options from amongst those at the highest level. Once they passed the assessment, a green flag was attached to the roofline and a ‘declaration of sustainability’ was provided by a qualified home assessor for possible use in the future should the occupant decide to sell the house.

The centre targeted businesses and households in the main street in order to give the program visibility. The co-ordinator estimates that 90% of the sign ups to the program occurred as a result of face to face contact outside the grounds of the centre. The workers at the centre were very active for the first four weeks and achieved 200 registrations. At last count, they had 380 householders or businesses register and achieve their white flag; 250 achieved the blue and 210 achieved the Green flag. Comments on the flag programs are very positive and believed to have contributed to a sense of community pride.

***Renewable Energy Retail Suppliers and Installers:*** three people were interviewed within this category of stakeholders; two were owner managers of similar medium sized enterprises that did retail, design and installation, and both have over 30 years in the industry. The other person interviewed had 25 years of experience and worked for the related Industry Association. In 2012 over 13 per cent of electricity in Australia was provided by renewable sources and as of 2013, there were 24,300 working in renewable energy industry across Australia (CEC 2012). These participants described jobs in this industry as involving, marketing, sales, systems design, engineers, architects consultancies, panel and system installers, electricians and plumbers. One interviewee employed 30 staff and the other 18. They explained that the industry was currently in turmoil due to the administration of government subsidies. Subsidies make solar installations attractive to consumers,

but successive governments announce subsidies and they then take them away. This leads to instability and insecurity. These managers explained that their longevity in the industry was due to them not relying on the subsidies and spoke of how this was an industry that was there for the making. Uncertainty about the economics though meant that they needed to be independent and viable for the times when the subsidies are rescinded. They argue that realistic 'feed in' tariffs are what are really needed along with a level playing field with the coal and gas producers.

Electricians need to do the wiring and installation of the electrical systems. Other installers can do the panel installations but by law only a licenced plumber can do penetrations through the roof. Careful and strategic divisions of labour are managed to control the costs. There are currently 4,500 registered electricians accredited to do installation work and approximately 322,000 installations were completed nationwide in 2012. Lessons have been learnt from the installation of pink bats with government rebates tied to installers being accredited. And accreditation is in turn tied to training and successful completion of three designated units of competence. Completion of these units though gives only provisional accreditation for three months. This must be followed up with a documented case study of an actual installation before full accreditation is approved.

A training program that received mention by all three of these participants was the Certificate IV in Renewable Energy. The Program co-ordinator and teacher in this course at one of the metropolitan TAFE Institutes was very well known to them all for his work throughout the industry. The program at that TAFE institute was considered cutting edge. A visit to three public TAFE providers confirmed the substantial investment being made in setting up actual systems for students to work on and learn through engagement with authentic industry quality installations and equipment.

***The TAFE Green Skills Centre:*** the design of this TAFE Green Skills Centre epitomises what it is teaching. The centre has a 5 star energy efficiency rating and by using contemporary thinking in passive design and strategic selection of materials, adhesives, paints and finishes, 'practices what it preaches'. The design minimises energy use and maximises

efficiency. The building has large arrays of solar photovoltaic cells on the roof and positioned in frames alongside the structure. It also uses the sun's rays to produce solar hot water. Likewise, rainwater is harvested from the roof and utilised in non-potable uses such as within the toilets. Rainwater tanks around the building catch and store over 110,000 litres of rainwater. Many of the services in the building are on show, to illustrate and be utilised in teaching sustainable systems. The building has a computer operated building management system. This does such tasks as monitoring carbon dioxide levels for air changes and control temperatures and air conditioning systems. The building has a geothermal ground source heat pump. This is used to draw in and transfer heat from the earth in winter and to use the earth as a heat sink in summer.

Many of the trade areas such as plumbing and electrical use the life size simulated buildings that have been erected inside the workshops for designing and installing alternative energy and sustainability systems. Conservation and land management, agriculture and animal sciences also utilise facilities in the building. The flagship programs though are the Certificate II and IV in Renewable Energy.

As the teacher explains,

*The two courses are taught concurrently over 1 year for full time students and cover areas of technology, PV, electrical, solar thermal systems for both building and hot water, accreditations for the Clean Energy Council, grid design, standalone power systems, install and design and wind accreditations. We do wind energy conversion systems as well, the course covers basic electrical/electronic theory and workshop practices, at trade level.*

These programs are taught by teachers with 20 years of experience working with solar energy. Both of the teachers interviewed were very proud of their teaching facilities and the direct input they have had into its design and building. Both are very committed, one has held leadership positions within the industry and professional associations. This teacher explains his commitment to the industry and his long term involvement in the Wilderness Society as part of his motivation. He explains that this support and commitment is reciprocated by the TAFE as they funded him to visit Germany for a professional development

program and to do industry visits.

One teacher explains that he sees green skills being a part of everyone's job but he also sees specialist job roles in sustainability and green skills as well. He describes how he sees the financial differences in building in sustainability and attempting to retrofit. Building it in is seen as being the much cheaper option. These teachers have made it their business to know many of the employers across the industry. They have established high credibility for their course and most of their graduates find jobs in the field. As one of the teachers explains,

*'The students we get in for the courses, they are on top of it because they are coming into the industry because they love it, they want more of it and they're hungry for the knowledge'.*

The students in these courses were also eager to discuss their training with the researcher and aspects of these interactions have been reported elsewhere (Brown & Sack 2012).

***Master Plumbers Association, the Plumbers Employee Union and the Plumbing Industry Climate Action Centre (PICAC):*** two people were interviewed within this category, one worked for the Master Plumbers and the other provided training at the Plumbing Industry Climate Action Centre (PICAC). PICAC is an industry partnership supported by the Plumbing Trades Employees Union, Master Plumbers and Mechanical Services Association of Australia, National Fire Industry Association, Air Conditioning and Mechanical Contractors Association, United Association and Plumbing Joint Training Fund (PICAC 2013). The Plumbing Industry Climate Action Centre (PICAC) is an industry led training facility in a 5 Green Star-rated building in Melbourne. The Centre is providing and showcasing innovative and authentic training to the plumbing industry in OH&S, Fire protection systems, Mechanical services and Green plumbing. While some plumbers are happy doing what they are doing, others are being pushed to learn about new technology, new products and new ways of plumbing. These tradespeople are on the front line when a customer's water service blows and they turn to the plumber to ask what is available to replace this system.

Green skills have been added into apprenticeship and even pre-

apprenticeship training as both core and electives. PICAC provides courses for apprentices, the more experienced post-apprentice plumbers and even plumbing trade teachers who work in TAFE Institutes and teach their own apprenticeship classes. Plumbers who are union members like apprentices can access this training at no cost to themselves. For self-employed plumbers a six day course is likely to cost around \$1200. The centre runs a range of programs. In terms of green skills, the programs include, energy efficient plumbing, alternative renewable energy systems, water conservation, urban alternative water, solar hot water, urban pumps, natural waste management, rainwater harvesting, and geothermal technologies.

The staff members who run these programs argue that they are very much in front of the pack, with their courses based on contemporary research and new technologies. It appears that the training staff at the centre has been recruited from amongst the plumbing teachers previously employed in TAFE Institutes. All training packages now have some sustainability units in them, but these interviewees considered these to be very generic and not closely enough related to plumbing. The two interviewees reported that from their experience, the motivation for plumbers to develop these skills is considered to be multifaceted. These capacities and knowledge are considered good for business, cost effective, future-orientated, and supportive of choosing to live a healthy and sustainable lifestyle.

**Riverside Regional Development Centre:** four community and industry stakeholders were interviewed from the Riverside Regional Development Centre. One explained his work as involving liaison with large scale solar energy developers to ensure that the workforce and required skill sets would be available if or when companies invest in this region. The second part of his job he describes as working with the industries of the region to review their energy and resources use. The other industry stakeholder explained that he is involved in mapping skills for roof top installation of PV systems. He also explained how he was involved in the bulk purchase of rooftop solar panels and installations.

The other two community representative stakeholders interviewed were members of the local Rotary Club and explained the community

initiative that they ran for changing over incandescent light globes. This club teamed up with the local SES and they ran the change-over as a small fund raising exercise. The Clubs contracted to change up to 2000 globes but in the end it became so popular that they did 6000 globes, across 500 houses and 25 businesses.

These participants explained that new sustainability related jobs were being created around solar panel installation and at the professional level a number of jobs in some local companies where spreadsheets and systems were being designed and implemented. These are then being handed over to accountants to keep the systems up to date and running. They likened the process to that of the roll out of safety in the workplace some 20 – 30 years ago, and how each large company now has a dedicated Safety Officer but the requirement to work safely is divested as the responsibility of each and all employees. Likewise they thought that in the future most large companies would have one main Sustainability Officer in the workplace but that it would become part of everyone's work practices to be more sustainable.

They also believed that new jobs would emerge that cannot yet be imagined. Much is dependent on the decisions of government and the levels of subsidies and financial support. One of these managers speaking about large solar projects noted that there needs to be 'feed in' tariffs and the goal is for grid parity. This regional community has experienced numerous media splashes about large innovative solar projects being launched in this region only to see the hype fade before their realisation. Failing to deliver has led to some frustration and scepticism across the community yet many still think that if solar is going to make it anywhere it should be able to happen in this region.

## **Conclusion**

The 'Living sustainably' Action Plan argues that EfS aims to tackle the underlying causes of unsustainable trends (pg 8). The form of education advocated is to initially raise awareness but which also develops capacities that enable the learner to take action and implement real and thoughtful change – informed, thoughtful and strategic action. The vignettes of the work-related learning programs detailed above epitomise these intentions.

From the evidence gained from this study it is apparent that new and adjusted work practices are being implemented across workplaces around new technologies and new products. These new ways of doing aspects of work are utilising renewable energy or are being designed to reduce use of finite resources and energy from fossil fuels. This is leading to some new specialist jobs in areas such as sustainability and renewable energy but the most change that is occurring to the majority of existing jobs is through the incorporation of changing work practices due to increasing environmental awareness, improving energy efficiency and the rising or ongoing costs of non-renewable resources and energy.

Most of the learning involves the development of new, and extensions to existing, skills and knowledge which are occurring across workplaces and within training courses. This skill formation is most often taking place through engagement with authentic installations, equipment, products and processes. Some of this skill development is happening on-the-job in the specific context of the work practices, some is going on in the community and some is also occurring through programs that are being run through new specialist and traditional institution-based occupational programs in TAFE, in enterprise-based training and industry-based training, and through community-based education programs.

The main drivers appear to be through a business case being made around increasing savings in the longer term, higher profits and avoidance of ongoing and rising clean-up costs. There is some concern being shown for the environment and the need to reduce pollution and start to address issues of climate change that are exacerbated through the continued use of finite resources and fossil fuels. Some have further extended this thinking to include the movement towards a more natural and long term sustainable existence. This was coupled with improving individual and community health and well-being. Some blockers seem to be the initial outlay of capital to purchase and upgrade new plant and the associated work practices; others cited inconsistency around the financial benefits from changing to renewable energy, while the contractors in these areas too, sought security through the implementation of a level playing field with others who provide and utilise finite resources and fossil fuels.

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