Climate Change, Employment and Local Development, Sydney, Australia

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BUILDING MORE AND BETTER JOBS
POUR PLUS D'EMPLOIS DE QUALITÉ

CLIMATE CHANGE, EMPLOYMENT AND LOCAL DEVELOPMENT IN SYDNEY

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FOREWORD

Sydney and its main organisations are undergoing an important transformation in terms of their approach to human capital development, growth and job creation, and integrating the sustainability component into the Sydney strategy and actions. Most of this process has been initiated some years ago, which has led to the modification of some axes of work in key institutions such as the Training and Further Education Institutes' programme on green skills, the city council's sustainability plans and other major projects, both in the public and private sectors.

Sydney is leading a wave of innovation in the country and has some state-of-the-art initiatives that are good examples to other OECD cities and regions. However, a challenge remains with respect to the functioning of the "green" system and the adjustments to the new needs of a low-carbon economy. Indeed, with strong large industries that successfully resisted the global crisis, it is difficult to transform some key economic sectors into more environmentally efficient ones as the uncertainty remains in the amount and quality of jobs to be created as well as in the skills required to access those jobs. Furthermore, the various stakeholders involved in this sustainable agenda in Greater Sydney need to invest in and prioritise actions that may create tensions, if coordination, dialogue and consultation are not ensured. With a good level of awareness of the sustainability challenge among the population and the acknowledgement of the ancestral natural heritage, Sydney has an extraordinary potential to pursue economic growth and wealth in a more carbon sober manner.

This report analyses the challenges and opportunities of Sydney in this context, and provides some policy recommendations on how the public authorities and other key agencies could best support the emergence of a green economy – making the best use of the skills available while creating wealth and growth. This study was carried out as part of the series of reviews on Climate Change, Employment and Local Development of the OECD Programme on Local Economic and Employment Development (LEED). This work stream is led by Gabriela Miranda, OECD LEED Policy Analyst. The main findings and recommendations have fed into the internal discussions leading to the definition of an OECD Green Growth Strategy, launched at the 2011 OECD Ministerial Council Meeting. The project has benefitted from the participation of Extremadura (Spain), London (UK), Podlaskie and Pomorskie (Poland) and Sydney (Australia). It has also received financial support from the European Commission.

We are very grateful to the six Sydney partners who engaged in this complex international exercise. I am convinced that the content of this report will be a valuable tool, not only for Sydney, but also for other cities and regions seeking to improve their environmental impact while creating jobs and economic growth.

Sergio Arzeni
Director, OECD Centre for Entrepreneurship
Head, OECD LEED Programme

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PREFACE

The OECD project on Climate Change, Employment and Local Development in Sydney examines the impacts (direct and indirect) of climate change on local labour markets, with a focus on the creation of green jobs and the development of a skilled workforce to meet the needs of the greener economy.

In particular, the project will identify and assess the:

1. impacts on job profiles and skills requirements on the work place;

2. challenges and opportunities arising for the work of public services and other stakeholders in the relevant policy areas; and

3. mechanisms and practices used to facilitate transformation and adaptation to greener demands of local labour markets.

The Sydney report is part of a large project. The project involves case studies in four countries, two global city regions: Sydney, Australia and London, United Kingdom, and rural case studies: Extremadura in Spain, and Polish regions of Podlaskie and Pomorskie. The report also draws on best practice models in a number of countries. The Sydney report will provide an input into the final OECD synthesis report.

The Sydney project is supported by six partners:

- City of Sydney

- Northern Sydney Institute

- Regional Development Australia Sydney

- South Western Sydney Institute

- Sydney Institute

- Western Sydney Institute

ACKNOWLEDGEMENTS

Strategic Economics Australia (Chapter 1) who also acted as local expert and ensured coordination among the Sydney partners.

Last but not least, thanks are also due to OECD LEED colleagues Dr. Cristina Martinez-Fernandez for her comments, Ms Michela Meghnagi for the statistical analysis, as well as Mr. Damian Garnys for preparing the surveys and providing essential assistance in running the online platforms.

EXECUTIVE SUMMARY

Of all OECD countries, Australia has the highest greenhouse gas emissions on a per capita basis. Australia and its largest city, Sydney, are vulnerable to climate change. The scientific evidence indicates that Sydney is getting hotter and is likely to be more prone to bush fires, rising sea levels and drought. The seriousness of the climate change challenge has been recognised by all tiers of government, business and community, although there is fierce political debate and differences about how to respond. The Australian Government has announced that it will introduce a price on carbon, initially a carbon tax followed by an emissions trading scheme, with compensation for energy intensive industries and most households. Both the government and opposition are committed to reducing greenhouse gas emissions by at least 5% below 2000 levels by 2020, and, in the case of the government, by up to 15-20% if there is a global agreement. The Australian Government has established a target of an 80% reduction by 2050.

To consider the scale of the challenge for Sydney, the report looks at its population and economic growth to 2020 (current national and state targets) and 2036, which provides the framework for the Sydney Metropolitan Plan 2036.

- The population of metropolitan Sydney[1], currently 4.5 million, is forecast to increase to 5 million people by 2020 and 6 million by 2036.

- Sydney's Gross Regional Product (AUD 2010) is forecast to increase from AUD 256 billion to AUD 328 billion in 2020 and AUD 489 billion in 2036.

- To attain greenhouse gas emission reduction targets of 5% by 2020 and 50% by 2036, Sydney needs to reduce GHG emissions from the current 56 $MtCO_2$-e per capita to 53 $MtCO_2$-e by 2020 and 28 $MtCO_2$-e by 2036.

These figures highlight the enormity of the challenge of sustaining economic and population growth whilst reducing annual per capita GHG emissions from the current 12.5 $MtCO_2$-e per capita to 4.5 $MtCO_2$-e per capita by 2036.

Like other large economies, Sydney is responding to the climate change agenda at a time of economic turbulence. To date, the Australian economy has escaped the worst impacts of the Global Financial Crisis and the Great Recession, but uncertainties remain. Key trade exposed sectors such as manufacturing, tertiary education, and tourism have been negatively impacted by strong terms of trade associated with a resources boom that is predominantly benefiting the resource rich northern and western states and territories. Economic modelling undertaken by the Australian Treasury indicates that it will be less costly to take early action on climate change and that the impact of a price on carbon will be relatively small over the long term. This report recognises that there will be winners and losers in the transition to the low carbon economy. There is a perception that some industries and regions will be more impacted than others.

This report builds on the OECD's Green Growth Agenda and explores opportunities at the city and local level to tackle climate change in ways that minimise costs and increase green jobs and skills. The report makes the distinction between green jobs, i.e. new jobs that are created through producing new green goods and services, and greening existing jobs, which involves increasing the sustainability tasks and skills associated with existing jobs. The evidence suggests that although new green jobs, such as the

design, manufacture and installation of advanced technologies like photovoltaics, are of critical importance, the most significant opportunities will be associated with greening existing jobs.

The Sydney partners in this project see the response to climate change or the transition to a low carbon economy as a core and ultimately decisive part of the challenge to create a sustainable city. Hence the report accepts the broad definition of green jobs as "jobs that contribute to protecting the environment and reducing the harmful effects human activity has on it (mitigation), or to helping to better cope with current climate change conditions (adaptation)"[2]. This approach builds on the seminal contribution of the globally-recognised definition of sustainability provided by the World Commission on Environment and Development (the Bruntland report), which emphasised the broader perspective of sustainability encompassing economic, social and environmental dimensions. In this context the challenge for metropolitan Sydney and its localities is how to enhance economic prosperity whilst continuing to improve social equity and environmental outcomes. Economic sustainability is concerned with competitiveness and value added production of goods and services. Social sustainability is associated with socio-economic indicators and opportunities for jobs, income, health, education and amenities. Environmental sustainability has carbon reduction as a centrepiece, but also encompasses biodiversity, air and water quality, waste management and land degradation.

An important issue in the debate about carbon policy and the economy is the relationship between national initiatives, such as the setting of a carbon price by national government, and city-based and local initiatives, which involve a range of policy instruments. Some Australian economists, including the government's Climate Change adviser Ross Garnaut and the Productivity Commission, argue that a market based solution such as a price on carbon at the global and national level will be sufficient to drive change towards a low carbon economy. Industries and households will respond to higher prices of carbon-intensive goods and services and shift to low carbon goods and services. In this view, local policy instruments, including regulations and incentives, are costly and inefficient.

This report argues that the market mechanism is a necessary, but not sufficient, condition to drive change towards a low carbon economy. Action is required at the local and metropolitan level. Cities consume over two-thirds of the world's energy and account for 70% of greenhouse gas emissions. Well-designed regulations and programmes are required to accelerate the transition to a low carbon economy. This requires a commitment to innovation, research, investment in green infrastructure and skills, and strong partnerships that expand opportunities for green growth.

Most importantly, it requires improved governance to focus major participants on practical ways to make the transition to a low carbon economy. The New South Wales Government has a strong commitment to reduce carbon emissions. However, metropolitan Sydney is comprised of 41 local government areas. Some councils, such as the City of Sydney, have made major commitments in response to the threat of climate change. On the other hand, others either lack resources or are yet to develop local initiatives. Many are lacking a clear vision about what to do about climate change. This creates a challenge in coordinating responses across the metropolitan area with such a diverse range of councils. Sydney requires action at the metropolitan and local level. Currently there is no metropolitan development agency and no agency responsible for reducing climate change. Whilst the recently released Metropolitan Plan for Sydney 2036 proposes a framework to address an integrated planning approach and is an important foundation plan, an integrated policy framework to support initiatives at the local level and new governance arrangements are required. Given the size, complexity and diversity of Sydney, one way to proceed would be to work in manageable sub-regions within Sydney where local governments, business and communities could collaborate to address problems.

This Sydney report makes the case that metropolitan and local strategies, based on collaboration between all tiers of government, business, researchers, education and training providers and the

community, are critical if ambitious carbon reduction and improved environmental outcomes are to be achieved. Climate change policy straddles a diverse range of disciplines and policies including planning and infrastructure, water and environment, education, labour markets and innovation. A vision is needed for what a low carbon economy in Sydney will look like.

The chapters of this report point to a number of strengths in the Sydney economy, including:

- a global city with dense networks of globally competitive firms with strong links to the Asia-Pacific region particularly in finance and business services;

- supportive policy frameworks at national and state levels;

- a strong awareness about the threat of global warming and the need for concerted action;

- an advanced economy with strong research, technological capabilities and skills base;

- a globally recognised higher education and vocational education and training system; and

- well-developed infrastructure, high-quality amenities and living environment that is attractive to mobile knowledge workers.

Key findings

The project involved inputs from a wide range of Sydney stakeholders, including a number of workshops. Key findings include:

The need for vision

Australia is moving beyond the sustainability debate into the practicalities of embedding sustainability into employment skills and the economy. Governments at all levels, including at metropolitan city level, need to provide an overarching vision of a sustainable economy and the role of government in supporting it.

Building the partnership

Greater direction and coherence is required for Sydney as a global city and the transition to a low carbon economy. Government leadership is required to articulate a vision for Sydney as a low carbon economy with an agenda for sustainability research, education, industries and infrastructure. The six Sydney based partners in this project are well placed to engage other industry, community and government partners in order to strengthen metropolitan wide partnerships. The project partners, as well as governments, industries and communities, are seeking to articulate a vision for Sydney as an innovative, skilled and sustainable economy. Sydney's competitiveness will benefit if the six partners actively engage with local government, enterprises and state agencies in each metropolitan regional catchment to build regional leadership and initiatives to support the growth of green industries, sustainability practices and green skills.

A sustainable economic strategy

The report outlines a case for the development of a metropolitan wide sustainable economic strategy based on the following elements:

- Articulate a clear vision for a lower carbon economy that generates good quality jobs.

- Focus on green clusters, particularly in the manufacturing sector, for which the region has a competitive advantage.

- Invest in strategic infrastructure that will enable green growth.

- Integrate demand-driven workforce development strategies with economic strategy. TAFE can act in a robust way as a group in terms of linking development policies through meaningful partnerships with business, unions and intermediaries.

- Foster creativity and innovation through collaborations among universities and research institutions, venture capital and other investors, industry innovators and key government officials to support the development of new and emerging green sectors.

- Leverage the different roles of government (regulatory, proprietary, landowner, facilitator/convenor and investor) to drive investment towards the creation of good quality jobs in the green economy.

Link the low-carbon economy to metropolitan planning

The framework of the Metropolitan Strategy and Metropolitan Plan 2036 provides important foundations to plan for and provide the green infrastructure required for a low carbon economy. In particular, the City of Cities, which emphasises the importance of strengthening employment centres close to where people live, reinforces the importance of investing in infrastructure and skills in high growth regions.

Strengthening the relationship between innovation and skills

Linkages between innovation and the metropolitan skills systems need to be strengthened. The importance of innovation to bring in new skills, focused on incremental steps that every business can take should be recognised. The system needs embryonic pilots that can take innovation out to others. New courses in sustainable technology design, production, management and maintenance are required at Vocational Education and Training (VET) and Higher Education (HE) levels. Attention needs to be given to entry-level jobs and skills. Education and training organisations are continuing to invest in cost effective and convenient ways to deliver green skills upgrading – with emphasis on e-learning, short courses, customised courses and local industry networks.

Public sector leadership

Sydney is developing a number of new learning models that could enhance the city's competitive advantage. For example, the City of Sydney is developing new models of sustainability around tri-generation systems, which integrate waste, water and energy efficiency initiatives. Landcom, the public land and housing developer, has used regulatory measures to improve household energy and water usages to diffuse new sustainability practices and systems throughout the metropolitan residential home construction industry.

Expanding export opportunities

Sydney is well positioned to increase export opportunities associated with sustainability including finance and business services, project evaluation and environmental management, education, sustainable

building and construction, sustainable water systems, waste management technologies, and research based renewables and energy efficient technologies. Significant growth opportunities have been identified to grow green jobs and skills in building and construction, lean manufacturing, finance, energy efficient technologies and renewables.

Importance of the VET system

The Australian and New South Wales Governments responded rapidly to the green jobs and green skills agenda associated with climate change policy, particularly through the vocational education and training (VET) system – e.g. Industry Skills Councils designed new sustainability units in courses, TAFE implemented major audits and introduced new programmes, and Green Skills Programmes were rolled out quickly.

Establishing local networks

More emphasis needs to be given to implementing initiatives to mitigate and adapt at local level and regional level, with particular attention on nurturing local partnerships to spur innovation around the low carbon economy and to support industry demand for new skills through SME networks. TAFE is well positioned to expand its role in the diffusion of sustainability skills to industry with more emphasis on working with local governments, regional agencies, and SMEs. Encouragement needs to be placed on community-based initiatives. There needs to be a deep engagement of Sydney residents and businesses. Regional Development Australia Sydney (RDAS) has a role in taking these examples and programmes and in linking them to broader issues of social and economic sustainability. The difficulty with local government is that it needs a forum for Local Councils to form a critical mass and state what it is that they demand (e.g. goods movement).

Improving measurements

Currently Sydney does not have a complete understanding of its green economy. The metrics are not right. Part of the challenge is one of definition. There needs to be some consensus regarding what are the key outcomes as Sydney shifts to a sustainable economy and what is to be measured. More focus needs to be given to defining criteria and to measuring the size, dimensions of greenness and the potential of the sustainable economy to grow.

Main policy recommendations

The report's analysis provides a basis for a set of policy recommendations aimed at supporting Sydney's transition towards a greener economy while creating jobs and supplying the skills required. Some of the policy recommendations are illustrated with practical examples (learning models) from approaches adopted in various regions across the OECD. The learning models can be found in the annex. The main policy recommendations have been condensed in Box 1. The details and analysis of each of them can be found in the report.

Box 10. Key recommendations

- Develop a common definition of green jobs

- Assess the impact of greener growth on the Sydney labour market

- Enable the disadvantaged and unemployed to benefit from "greener" jobs

- Develop a Sustainability Forum for Sydney

- Assess training needs based on analyses of market opportunities

- Strengthen the ability of local businesses and training providers to develop solutions for skills for sustainability

- Seek to leverage the work already underway under the Sustainable Sydney 2030 vision to achieve international leadership

- Maintain a systematic approach to preparing Sydney's people for participation in the green economy

- Push infrastructure investment through critical mass of LGAs

- Dive deeper into identifying and supporting clusters in the green economy

- Form industry-university-capital-government-labour consortium to support innovation in targeted green clusters

- Leverage government's procurement power to drive green demand

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Action plan

Sydney formed a Project Management Group, reporting to the Executives of the respective project partners, to manage the project. The objectives of the partners were, firstly, to undertake more detailed research into Climate Change, Employment and Local Development in Sydney, and, secondly, to look at how they could work collaboratively and strengthen partnerships with other stakeholders to implement actions across the whole metropolitan area.

The current local partners of the project are in the process of assessing a number of actions to further implement the aims of both this and the OECD project synthesis report. Significantly they will be seeking to examine appropriate mechanisms of collaborative partnerships to include other local governments, other levels of government and other skill stakeholders across metropolitan Sydney. Actions being considered include, but are not limited to the following:

Governance

1   Draft and sign an MOU, with the aim of supporting and implementing initiatives to increase employment and the skills needed to support the growth of a low carbon economy in metropolitan Sydney.

2   Establish an entity, Sustainable Sydney Partnership, with resources for a shared strategic broker, open to government, industry and community participants, which can articulate a vision for a low carbon metropolitan economy, organise activities and events, strengthen relationships and initiatives with cities throughout the Asia-Pacific region, and promote Sydney as a low carbon economy.

3   Collaborate with and seek support from industry and government, for the development of an action based Sustainable Economic Strategy for Sydney, which identifies emerging sectoral industry, technology and skills, and collaborative actions to grow these opportunities.

4   Strengthen global relationships for sustainability, particularly in the Asia-Pacific region, including working with the OECD and linking in with Global Connect, the Global Green Grid and others to support international knowledge flows and organise major events in Sydney to promote sustainability technology, practices and education.

Expanding opportunities across Sydney

5   Work within the framework of the current Sydney Metropolitan Plan 2010 and collaborate with local government and industries at the local and sub-regional level to integrate the economic and sustainability outcomes associated with the City of Cities (which is centred on increasing employment and high skilled opportunities in strategic employment areas across metropolitan Sydney).

Green Infrastructure

6   Encourage investment and upgrade skills in green infrastructure, particularly integrating waste, water and energy efficiency and, through the City of Sydney, encourage the diffusion and awareness of best practice trigeneration with investors, energy agencies and developers across the metropolitan area.

Innovation

7   Expand opportunities to develop the sustainability agenda around innovation, with attention to establishing innovation networks, promoting demonstration projects, diffusion of best practice energy efficient projects, partnerships with energy distributors and retailers, knowledge exchange with leading sustainable cities and industries, and expansion of online learning opportunities.

8   Foster innovation with sustainability centres of excellence and state centres across the Vocational Education and Training (VET) system in Sydney, including TAFE institutes collaborating to support greater specialisation and closer alignment with research and higher education institutions.

Emerging Opportunities

9   Identify and work with other stakeholders to establish a Renewables and Energy Efficiency Working Group and approach the NSW Government to develop industry and skills strategies to

maximise investment spinoffs and skills associated with attaining the national 20% renewables target by 2020.

Networks and relations

10 Work with government, industry and unions to establish sustainable industry networks in metropolitan Sydney amongst small and medium-sized enterprises in selective industries in building and construction, manufacturing and business services with the aim of providing opportunities for project identification, technological and product innovation and effective and low cost skills upgrading.

Community connections

11 Implement community based initiatives aimed at increasing sustainability literacy in schools, community networks and households through extension of accredited and non-accredited short courses, and strengthening articulation and pathways through secondary, vocational and higher education.

12 In partnership with local government and employment service organisations such as Job Services Australia, develop new initiatives to support disadvantaged people to gain access to learning and job opportunities in sustainability tasks and occupations and, in particular, improve opportunities for entry-level jobs.

Communication Strategy

13 Design and implement, in partnership with government and industry, a communications strategy to promote an identity of Sydney as a sustainable city, along with the values, attitudes and skills associated with a low carbon economy and the employment opportunities associated with the transition.

14 Promote the VET sector as a leader in sustainability learning, continually strengthen teaching capabilities and demonstrate the adaptability of Sydney's VET training packages at a local level to meet local needs and demands.

CHAPTER 1.

CLIMATE CHANGE, EMPLOYMENT AND LOCAL DEVELOPMENT IN SYDNEY

By Graham Larcombe

Abstract

This chapter offers an overview of the Sydney metropolitan economy. The chapter describes the various stakeholders involved in the low carbon economy in Australia and Sydney, and the policies and programmes currently in place. It explains the current economic and environmental dynamics, as well as the challenges and opportunities for the metropolitan economy in the transition to a low carbon economy. It concludes with a diagnostic analysis of Sydney in the context of the green economy.

Background

Australia is vulnerable to climate change. This is particularly in relation to natural impacts including drought, rising sea level and extreme weather events. It also includes the potential negative impacts on carbon-intensive and agriculture exports, which underpin much of Australia's recent economic success. Greenhouse gas emissions are increasing, and are now 5% above 1990 levels, but major sectors, particularly energy consumption and transport, have grown at a much faster rate over this period.

Sydney is Australia's largest city, and comprises around two thirds of the population of New South Wales (NSW). The NSW Government recognises that climate change is having a significant impact on Sydney and the state. The Sydney Metropolitan Plan 2036 highlights the challenges and risks associated with climate change[3]. The scientific evidence suggests that Sydney's daily temperatures are now between 0.5-0.9 °C hotter than average than last century. The metropolitan area is expected to be in the range of 1-3 °C hotter by 2050. Sydney is likely to experience increases in fire frequency. In a drought prone region, rainfall is likely to become more unpredictable and sea levels to rise by 40 cm by 2050 and 90 cm by 2100. A commissioned report for the Plan estimated that 2008 energy consumption in the Sydney Metropolitan Area was approximately 365 PJ, equivalent to 54 $MtCO_2$-e.

Of all the OECD countries, Australia, with 26.08 Mt CO_2-e, has the highest GHG emissions on a per capita basis. Figure 1 compares Australia's per capita emissions with some of the world's largest economies (excluding China). It shows that USA is in second place with around 22.22 Mt CO_2-e per capita. Australia's GHG emissions are also the highest in the world as a proportion of GDP. This is due to high dependence on coal for power generation and vehicle dependent transport systems. Australia is also the world's largest exporter of thermal coal, which is the most carbon intense input into power generation.

Figure 1. GHG emissions per capita MtCO2-e (2008)
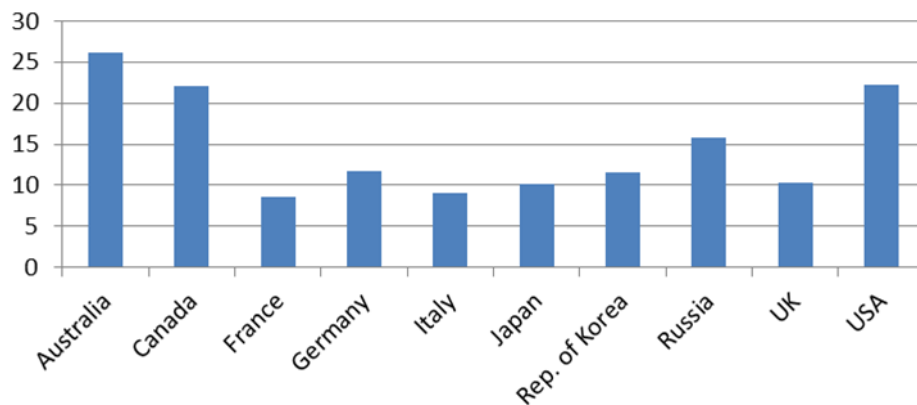
Source: United Nations Environmental Indicators

Challenges

A high carbon economy creates major challenges for Australia and Sydney, its largest city. On the one hand, there is community awareness about climate change and the importance of taking mitigating action. The Australian Government is committed to the Kyoto Protocol and has announced its Clean Energy Future Plan, which involves the introduction of a carbon price and aims to cut carbon pollution, encourage carbon reducing innovation and investment in renewables. The NSW State Plan commits the state to reducing greenhouse gas emissions by 60% by 2050. This may be revisited, given that the Australian Government has announced a target to reduce emissions by 80% by 2050. On the other hand, national and metropolitan GHG emissions continue to increase. Sydney's current development path has produced significant material benefit for businesses and households without the discipline of accepting and taking fundamental action in relation to climate change.

Of the many challenges confronting Sydney's response to climate change, three are particularly relevant to this report:

- climate change and jobs

- shifting Sydney onto a sustainable development path

- governance of metropolitan Sydney.

Climate change and jobs

Arguably the most difficult political and economic challenge for Australia, as for other countries, is how to respond to the world's climate change crisis in the context of global economic turbulence and uncertainty. Although there is general consensus that climate change is a threat, there is intense disagreement about employment impacts, and political conflict regarding what to do about it.

Numerous studies have sought to estimate the impacts of the transition to a low carbon economy. The Australian Government established the Garnaut Climate Change Review to examine the impacts of climate change on the Australian economy and to recommend policy responses[4]. An updated report recommended that Australia adopt a carbon tax followed by the introduction of an emissions trading scheme in 2015, with some support for innovation, structural change and compensation[5]. In the event of early action, the

report estimated that the economic cost of an emissions trading scheme, to keep emissions within manageable limits, could be kept within the order of 0.1-0.2 % of annual growth per year.

One perspective is that market based carbon prices and policy initiatives, by driving opportunities for green industries and green skills, will provide a massive boost to the economy, which, ipso facto, will underpin competitiveness of major metropolitan economies. For example, in 2008, the government's major scientific and industrial research agency, the CSIRO, prepared a report: Growing the Green Collar Economy[6]. The report estimates high job impacts over the next 10 years, with between 230 000 and 340 000 new jobs nationally in high environmental impact industries. The report identifies job growth will occur in high material flow sectors, including food, energy and mining, recycling, manufacturing, transport and construction. Occupational opportunities were expected to be diverse, ranging from trade skills (green plumbing, construction and retrofitting of energy efficient buildings, renewable energy and low input horticulture); planning, management and leadership skills (procurement, fleet management and innovative practice) and assessment (energy auditing, water efficiency, meeting environmental specifications).

Alternatively, others have argued that the introduction of the carbon tax will destroy the competitiveness of Australia's energy intensive trade exposed industries and impose a major tax impost on households and industries. In response to claims that pricing carbon would destroy Australian competitiveness, some studies have looked at the impact of a carbon price on industry competitiveness. The Grattan Institute[7], for example, suggests that although energy intensive industries, such as alumina refining, LNG production and most coal mining, will be less profitable, they would still be internationally competitive.

The Australian Government has announced that, with the introduction of a carbon tax (see below), some energy-intensive industries, such as steel, cement and aluminium, will receive assistance through its Jobs and Industry Programme. With the exception of cement, these industries don't have a strong presence in the metropolitan economy. This suggests that the negative impacts on industry and overall employment in the Sydney metropolitan area are likely to be small.

The Australian Treasury makes the case that taking early action, through market based carbon instruments, is Australia's best option[8]. Treasury modelling concludes that action on climate change will have a relatively small impact on GNP growth. The Treasury estimates that from 2010 to 2050, Australia's real GNP per capita will grow at an average annual rate of 1.1% if preferred carbon instruments are implemented compared to 1.2 % without carbon reduction policies.

In addition to analysing the impact of new policy instruments, the overall performance of the Sydney metropolitan economy is also a concern. For much of the past 30 years, Sydney has been recognised as Australia's global city. The city's success was largely driven by its links to the global economy, associated with continuous flows of capital, goods and services, people and ideas.

During the post-deregulation boom, increases in consumption and property appreciation became major drivers for growth. More recently, and particularly since the onset of the Global Financial Crisis, Sydney's growth has been sluggish. High household indebtedness, intense global competition in manufacturing and increasingly in service industries, as well as infrastructure constraints, have undermined Sydney's economic competitiveness. Sydney was particularly prone to increase in household indebtedness due to significant increases in house prices. Over the period 1990 to 2008, Australian household debt rose dramatically in real terms from around AUD 190 billion to AUD 1.1 trillion. Over this period, household debts, particularly in Sydney, grew faster than household income. The ratio of household debt to disposable household income plateaued at around 160% in 2008, and has declined only marginally since[9].

Macro-economic factors, particularly the appreciation of the Australian currency and high terms of trade associated with the resources boom, impacted the competitiveness of Sydney's key industries. Hard hit industries include tourism, education, manufacturing and globally competitive business industries and creative industries, such as film and events.

Some commentators are referring to Australia's two-speed economy, with South Eastern states, and major cities including Sydney, lagging behind the resource rich north and western states and territories. This poses the question about future directions of the metropolitan economy and the importance of green industries and skills in opening up a new era of prosperity for Sydney, or whether the cost of the transition will undermine investment and job growth.

Shifting Sydney onto a sustainable development path

One of the most significant challenges is to shift Sydney onto a more sustainable development path. Major sources of GHG emissions are industry and household energy consumption and transport. Sydney's rapid growth over the past 60 years has been built on the foundations of cheap energy, rising per capita incomes, and car dependence. Urban development strategies and household preferences promoted low-density suburban development, and an increasing share of large houses with high-energy consumption.

Sydney's capacity to accommodate an additional 1.5 million people by 2036, i.e. a total of 6 million, depends on how successful the city is in managing the transition to a sustainable development path. By sustainable development path it should be understood strategies, directions, skills and investment that grow the economy, whilst providing opportunities for greater equality and equity, and protecting and enhancing the environmental values of the city and its surrounding catchments.

In NSW 98% of electricity is generated from coal fired stations, the primary anthropogenic contributor to climate change. These coal-fired power stations are not located in the Sydney Basin but to the north and west of the metropolitan area. NSW also purchases around 1 100 MW of coal fired electricity per annum from Queensland. Large transmission lines are required to transfer the energy from the power stations over long distances to predominantly urban-based consumers. From an energy and environmental perspective, this is inefficient with around 35% of the energy lost (and hence more greenhouse gases) before the electricity reaches industrial, residential and other consumers.

NSW has around 18 000 megawatts (MW) of installed electricity generation capacity. Energy demand continues to grow, with projections of around 1.8% growth per annum to 2020[10]. New capacity is required. There are currently around 10 500 MW of publicly announced projects to expand capacity, around 4,700 MW from coal or gas, 3 202 MW from gas and 2,555.9 MW from wind. The issue is whether the state will proceed with new coal fired capacity, or encourage less greenhouse gas emitting sources.

Given that households account for 30% of total electricity used in the state, improvements in Sydney's household energy-efficiency are critical to reduce greenhouse gas emissions. Household energy use is too high, although higher prices and diffusion of energy-efficient technologies and appliances are reducing household electricity consumption. Household improvements include widespread use of energy efficient hot water systems and light bulbs, but these gains are offset by long term increases in the size of houses.

It is reported that Australian houses are the world's largest[11]. On average Australian homes are three times larger than the average British house. Further, the report estimates that New South Wales has the biggest houses in Australia with an average house built measuring 262.9 m² in 2008-09. From the early 1980's, energy consumption in households experienced high rates of growth. Despite growing household

concerns about climate change, this was not being reflected in significant reductions in household energy consumption. In fact, household energy consumption continued to increase, albeit at a slower rate.

Lack of investment in public transport infrastructure has contributed to significant increase in GHG emissions from vehicles. The number of vehicles in Sydney increased to almost 2.4 million in 2007, with the number of vehicles increasing at almost twice the rate of population and household growth over the past decade[12]. More people in outlying areas are dependent on cars for commuting, shopping and education because public transport services are poor. Between 2002 and 2020, Sydney's (unconstrained) traffic volumes are forecast to increase by 33%[13].

Governance

Climate change is an all-embracing agenda impacting all aspects of society. The challenge is how to coordinate policy and action across industry, households and government agencies. In relation to government, climate change policy straddles all tiers of government, departments and agencies including water, energy, waste, industry, education and environment.

Climate change policy and adaptation measures will drive major transformation across the metropolitan, state and national economies, including industries and households. But the transformation, even with a carbon price, is unlikely to be smooth. There are many recognised barriers – structural, financial, institutional, informational and attitudinal – that will continue to impede the transition to a low carbon economy. For example, households and firms don't always consider life cycle costs of technologies, equipment and appliances but more often purchase at lower costs. Older plumbers and electricians won't always invest in upgrading their own sustainability skills. Oligopolised industries often seek to pass higher costs (including carbon prices) onto consumers rather than investing in new technologies, skills and plant. A price on carbon alone will be insufficient to get major infrastructure agencies to align planning and investment decisions with climate change mitigation measures.

Commitments and obligations to GHG emission reductions are putting a high demand on new skills and workforce development in a range of industries. The evidence suggests that skill shortages are perennial problems when economies undergo major transformation and this can lead to bottlenecks. This requires a major and ongoing commitment to skills upgrading to manage the transition to a sustainable economy.

A major challenge is to recognise the importance of spatial policy, specifically at city level, in combating climate change. Market based solutions do not consider spatial specific initiatives at the local and metropolitan level that underpin economic and skills demand. To attain major GHG reductions, good governance is an important part of the solution. Currently, metropolitan and regional agencies lack the resources and authority to plan for and implement initiatives to reduce climate change. The Sydney case study highlights the reasons why coordinated local and citywide action on climate change is so important.

First, cities like Sydney, containing a large concentration of industries and population, are major greenhouse gas emission generators in their own right. It is not just about individual economic agents but clusters of activities and supply chains and how they incorporate carbon reduction strategies in procurement and other business activities.

Second, the agglomeration of innovative capacity, business networks and skills in metropolitan areas are important foundations to generate and diffuse new technologies and practices. Changes in behaviour are increasingly driven, not just by prices, but also through interaction between firms, energy authorities, researchers, public sector agencies, and councils.

Third, planning and investment in mitigation and adaptation measures are becoming increasingly important for households, industries and infrastructure networks. Many decisions impacting GHG emissions are long term such as public transport infrastructure, growth of compact employment centres and sustainable energy networks. These initiatives shape urban outcomes including business spinoffs to firms and demand for skills. They also often require coordination between public and private agencies to impact outcomes.

Fourth, irrespective of a carbon price, there is a great deal of momentum at the micro and regional level, in business, the community and the three tiers of government, to encourage the growth of low carbon activities. This includes local innovation and diffusion of technologies, investment in carbon reducing local infrastructure, establishment and management of business and training networks.

Policy coherence and consistency in relation to green economy initiatives are required at the metropolitan, or local and sub-regional level. Councils have an important role to play including articulating an economic and sustainability vision for their areas, diffusing sustainability ideas and practices, managing local regulatory, planning and approval instruments, designing green infrastructure and facilitating, promoting new industry and skill opportunities, and working with industry, households and energy authorities to promote critical mass in low carbon energy use.

More could be done in Sydney to encourage local and sub-regional collaboration and coordination. Sydney is comprised of 41 local government areas with significant differences in population, budgets, size, socio-economic characteristics and industry and occupation structure. The metropolitan area is also covered by five larger groupings or what are termed regional organisations of Councils (ROC's), as well as 10 sub-regions designated by the Metropolitan Plan.

In response to the climate change challenge, metropolitan councils have adopted a diverse range of local actions. Initiatives include green infrastructure such as cycleway and pedestrian paths, planning compact and sustainable communities, involvement in green energy systems and networks, design and monitoring of local sustainability indicators and involvement in business networks e.g. building and manufacturing that promote green investment, jobs and skills.

NSW and Sydney's Greenhouse gas emissions

Australian Government GHG emissions data is provided by states and territories, but not by cities. In 2008, total national emissions were estimated at 549.5 Mt CO_2 –e. New South Wales (NSW), as Australia's largest state, was the largest emitter on a state basis, with 164.7 Mt CO_2 –e, or 29% of the national total. Table 1 shows greenhouse gas emissions trends in NSW from 1990 to 2008. The major sources are associated with stationary energy generation and transport. Agriculture and land use, land use change and forestry show significant reductions, whereas energy (mainly from coal fired power stations) and car dependent transport is continuing to increase.

Table 1.   New South Wales Mt CO2 equivalent emissions 1990-2008

Greenhouse gas source and sink categories	1990	2008	Change 1990 to 2008 (%)
Energy industries	47 835	67 606	41.3
Manufacturing and construction	8 406	8 997	7.0
Transport	18 412	21 803	18.4
Other sectors	3 511	4 434	26.3
Other	171	125	-26.7
Fugitive emissions and fuels	19 326	19 762	2.3
Industrial processes	12 536	11 905	-5.0
Agriculture	22 919	16 542	-27.8
Land use, Land use change and forestry	24 224	8 250	-65.9
Waste	6 786	5 246	-22.7
Total	**164 126**	**164 670**	**0.03**

Source: Australian National Greenhouse Accounts State and Territory Greenhouse Gas Inventories

The NSW Department of Planning commissioned consultants Arup to prepare a snapshot of Greenhouse Gas Emissions (GHG) for the Sydney Metropolitan Area[14]. For 2008, the report estimates that Sydney's GHG emissions amounted to 54 Mt CO_2-e. Sydney accounts for 42% of the state's GHG emissions, whereas its share of NSW's employment amounts to 62% and population 59% of the state total. This is due, according to Arup, to the concentration of high-energy intensive industries outside Sydney in the industrial Hunter and Illawarra regions, as well as non-urban emissions associated with agriculture and forestry.

Figure 2 adjusts the Arup estimate slightly upwards, showing 56 Mt CO_2-e for 2010. The figure uses this data to establish possible metropolitan GHG emission targets for 2020 and 2036. These dates are important as they are based on the Australian Government's national target of a 5% reduction of GHG emissions by 2020 and the Sydney Metropolitan Plan for 2036. Based on these milestones, the figure shows targets of 51Mt CO_2-e for 2020 and 28 Mt CO_2-e for 2036[15]. When account is taken of the growth of energy consumption and transport demand over the past 20 years, as well as the projected growth of population and economic activity, achievement of these targets will require a major transformation of the city economy encompassing production, households and energy and transport networks. An initial challenge is how to deal with the scale of metropolitan Sydney.

The report suggests that Sydney's GHG emissions are reasonably evenly spread across manufacturing and industrial, residential, commercial and transport sectors, with manufacturing and industrial slightly higher. It is important to recognise, as the report does, the limitations in the current data, and the importance of improving spatial data collation and monitoring of GHG emissions.

Figure 2. Metropolitan Sydney projected greenhouse gas emissions 2010-2036 MtCO2-e
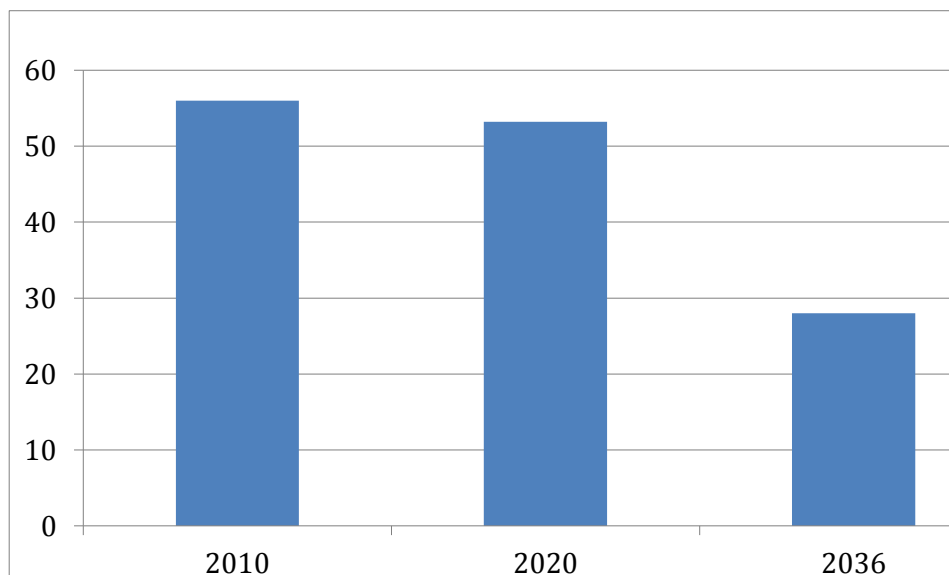
Source: ARUP

The Climate Change Policy Context

The three tiers of government are working on responses to greenhouse gases. The Australian Government became a signatory to the Kyoto Protocol in 2008. Government policy is to reduce greenhouse gas emissions by 15-20% by 2020 in the event of a global agreement and a 5% reduction if Australia acts unilaterally. The opposition coalition parties support a 5% reduction but favour direct action rather than a carbon price. They propose to revoke the carbon tax if elected. The NSW Government has a target to reduce GHG emissions by 60% and a number of metropolitan councils are implementing climate change initiatives.

An important challenge is to find the appropriate policy instruments to reduce GHG emissions. The Australian Government, following advice from its main policy adviser Professor Ross Garnaut and Treasury, accepted the argument that a carbon price, supported by research, innovation and compensation measures, is the best mechanism to drive change in industry and household behaviour. The dominant view is that other abatement measures such as regulations will be too costly and less effective. However, the faith in market solutions alone is not universally shared. An alternative view is that in order to be effective, a mix of market based, planning, institutional and regulatory measures will be required. This is because, however well designed, market solutions are not sufficient.

National initiatives

Clean Energy Plan

The Australian Government has announced a Clean Energy Plan. Legislation will be introduced in 2012, designed to reduce greenhouse gas emissions and encourage the transition to a low carbon economy. The lynchpin of the Plan is a carbon price, commencing at AUD 23 and targeted at the 500 largest polluters. The aim is to have in place a market based emissions trading scheme to replace the carbon tax by 2015. Revenue from the carbon tax will be used to expand research, development and demonstration through a new Australian Renewable Energy Agency (AUD 3.2 billion over five years). A new

organisation, the Clean Energy Finance Corporation, is to be established to provide loans and/or equity in renewables such as wind, solar and geothermal, and hybrids such as renewables, fossil fuels and energy efficiency measures.

Renewable energy target

National and state/territory governments, through the Council of Australian Governments (COAG), have endorsed a national Renewable Energy Target, which is designed to ensure that 20% of Australia's electricity supply will come from renewable sources by 2020. The target is broken into two parts - Small-scale Renewable Energy Scheme (payments to households, small business and community groups for certified small-scale technologies like solar panels and solar water heaters) and the Large-scale Renewable Energy Target (LRET). LRET, which covers large-scale renewable energy projects like wind farms, commercial solar and geothermal, aims to increase national renewable generating capacity from 10 100 Gwh in 2011 to 41 000 Gwh in 2020, resulting in a significant increase in employment and demand for new skills.

National Strategy on Energy Efficiency

COAG has endorsed the National Strategy on Energy Efficiency. The Strategy aims to accelerate adoption of energy efficiency in buildings, households and businesses, and estimates that 50% of carbon savings by 2020 will come from energy efficiency measures.

Energy efficiency skills and knowledge requirements for the transition to a low carbon economy are many – from professionals in engineering, architecture, industrial design, energy services including audit and advice, environmental sciences, planning and policy, to technical skills in a wide range of trades and industries. The transition to a low-carbon future will demand the development and application of knowledge and skills that may not be sufficiently available in Australia at present. The strategy makes a commitment to integrating energy-efficiency with skills policy. This includes developing the **National Energy Efficiency Skills Initiative**, to provide for the future skills requirements of a low carbon economy, and the implementation of sustainability strategies.

National Smart City Demonstration projects

The Australian Government has committed up to AUD 100 million to develop the **Smart Grid, Smart City** demonstration project in partnership with Energy Australia, industry and Newcastle City Council (160 km north of Sydney). The demonstration project aims to improve the efficiency of power production, delivery and use, including some trials in Sydney's Central Business District (CBD). CSIRO is working with Energy Australia to maximise the benefits from smart grid infrastructure and using CSIRO expertise in advanced control systems and artificial intelligence.

The Australian Government also funds the **Solar City Programme** which, in 7 successful cities (including Blacktown, Sydney's largest local government area), aims to:

- demonstrate the environmental and economic effects of combining cost reflective pricing with the widespread use of solar technology, energy efficiency and smart meters; and

- find out what barriers exist regarding energy efficiency, electricity demand management and the use of solar technology, among businesses and householders in different parts of Australia, and test ways to deal with these barriers.

New South Wales

The NSW Government has important responsibilities in climate change policy due to:

- ownership of all major electricity generation, and regulation of distribution and retail networks;

- responsibilities for publicly funded vocational training and, in particular, TAFE NSW;

- metropolitan planning, built environment regulations, transport infrastructure, environmental and industry policies; and

- role in overseeing local government policy and programmes.

The NSW Government stated its intention to produce a Climate Change Action Plan, but at this stage it has not been released. A recent election in NSW has resulted in a change in government and a review of climate change policy. A small sample of initiatives implemented includes:

NSW Climate Change Fund

The Government established the NSW Climate Change Fund in 2007, which includes:

- Residential Rebate Programme to households for solar hot water, insulation and rainwater tanks;

- NSW Green Business and Public Facilities Programmes, which fund water and energy saving projects in public enterprises, schools, community buildings, sporting facilities, museums and art galleries;

- Renewable Energy Development Programme, which supports sustainable energy technologies;

- Schools Energy Efficiency and Rain Water Tanks in Schools Programmes; and

- Recycling and Stormwater Harvesting Programme.

TAFE NSW Education for Sustainability Action Plan 2007-2010

NSW TAFE is one of the world's largest public providers of technical and further education. It operates 10 institutes across NSW. Four partners in this project: TAFE NSW Northern Sydney Institute, TAFE NSW South Western Sydney Institute, TAFE NSW Sydney Institute, TAFE NSW Western Sydney Institute are based in Sydney. NSW TAFE puts priority on training teachers in sustainability skills, providing industry training, investing in advanced facilities and running accredited training courses.

TAFE NSW has released a plan: The TAFE NSW Education for Sustainability Action Plan 2007-2010. The aim of the plan is to "provide a framework of strategies and actions for educating for sustainability to ensure TAFE NSW meets its vision of an education and training system that underpins and improves social and economic wellbeing and sustainable development for the people of NSW".

NSW Green Skills Strategy

The NSW Department of Education and Training, in partnership with the Department of Environment and Climate Change and Water and the NSW Board of Vocational Education and Partnership, has released the NSW Green Skills Strategy. The Strategy identifies nine priority industries: manufacturing, electricity

and gas, water, construction, agriculture, forestry, fishing and land management, wholesale and retail trade, transport and storage, property and business services and government administration (especially local government).

The strategy has five elements:

1. Prioritise funding for training related to environmental sustainability

2. Build the capacity of trainers and training organisations to provide environmentally related training

3. Establish green industry partnerships identifying business and training opportunities in green markets

4. Publish a green workforce business guide containing information and advice for employers and workers on green skills

5. Implement skills strategies for NSW Government environmental programmes.

BASIX

In 2005, the NSW Government introduced legislation to establish BASIX, the building sustainable index. The legislation required that all new homes use less potable water and reduce greenhouse gas emissions. To obtain BASIX certification, all new detached residences must demonstrate that they will use up to 40% less potable water and produce up to 40% fewer greenhouse gas emissions than the average home. These developments are also required to achieve an appropriate level of thermal performance. The targets take into account specific local conditions. Water targets reflect variations in soil type, climate, rainfall and evaporation rates, and energy targets reflect building type and location. Residential apartment buildings must attain a 20% reduction in water and energy use.

To meet energy consumption targets, new building designers can choose from a range of options such as solar, high efficiency gas or an electric heat pump hot water system, high efficiency air conditioning systems, and energy efficient light fittings and use natural lighting. Builders are also encouraged to improve household efficiency of new homes. To meet targets they can insulate walls, ceilings, roofs and suspended floors, encourage natural ventilation, use light or medium coloured roofs to reduce heat gains, arrange glazing to reduce heat gains, and design eave overhangs, pergolas or other external shading devices to permit winter sun. This regulatory framework has resulted in diffusion of new employment opportunities and skills through the residential construction industry.

The metropolitan demographic and economic context

The Sydney metropolitan area is comprised of 41 local government areas and the Sydney Statistical Division covers an area of 12 144.6 km² [16]. With a population of 4.5 million people, Sydney is Australia's largest city, representing 63.1% of the population of NSW and 20% of Australia's population. In terms of age distribution, around 1.45 million residents (33%) are young (24 or under), while 608 000 residents (13.8%) are over the age 65.

Sydney has some distinctive features. Most importantly, it is Australia's largest city, and Australia remains one of the fastest growing countries in the OECD. A high proportion of national population growth, largely driven by skilled migration, is forecast to be accommodated in Sydney. High growth rates have important implications for carbon reduction policy. The city's population has grown strongly over the past 60 years, averaging around 1% growth per year, driven by natural increase (fertility rate 1.78) and relatively high rates of migration. Migration has transformed Sydney into a multicultural city,

accommodating the largest share of migrants settling in Australia. This puts consistent pressure on the city's housing and infrastructure and GHG emissions.

Historically, the city evolved from the CBD and spread out westward, initially along public transport corridors. The post-war pattern of urban development was predominantly characterised by low density, with social preferences for suburban growth in what has been termed the "quarter acre block", which resulted in the growth of car dependent suburbs to the west. Over the past 30 years, urban planners and governments have sought to create a more compact city through encouraging population growth around established areas rather than continuing to spread, particularly to the west. This approach resulted in some success for many years, with an increase in multi-unit dwellings in built up areas, but it appears to have peaked with an increasing share of Sydney's population moving to the developing areas of Greater Western Sydney.

Figure 3 summarises Sydney's population projections over the next 25 years to 2036, indicating the metropolitan area will accommodate an additional 1.5 million people. Over the critical decade to 2020, Sydney will accommodate an additional 500 000 residents. This has important implications for carbon reduction policy. Under business as usual scenarios, Sydney's emissions will increase by an additional 6.25 million tonnes CO_2-e by 2020 and 18.67 million tonnes CO_2-e by 2036.

Figure 3. Metropolitan Population projections 2010-2036
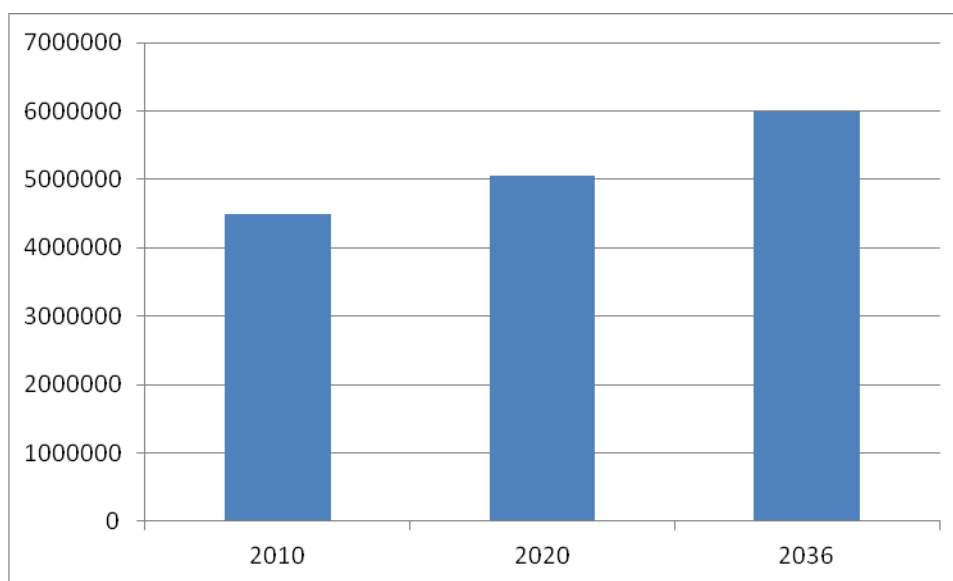
Source: NSW Department of Infrastructure and Planning

Sydney's growth and these geographical shifts have significant implications for sustainability, particularly in terms of the type of houses, transport, jobs and infrastructure (discussed below). The shift in population to the west of the metropolitan area is pronounced. In 1947, around 16% of Sydney's total population of 1.5 million lived in Greater Western Sydney. By 2010, almost 50% of the population lived in Western Sydney, and, based on current projections, this will increase to over 60% by 2051.

There are now almost 2 million people living in Western Sydney, twice as many people that live in Brisbane, making it one of Australia's most substantial urban areas in its own right. By 2036, the Department of Planning has forecast that the population of Western Sydney will increase by an additional 1 million people, more than twice the increase in population forecast for established parts of Sydney (see

Figure 4). The problem is not one of urban sprawl per se, but one of long term neglect of investment in urban infrastructure, particularly transport, and public leadership in meeting the costs of new urban development. On the other hand, significant population growth is also occurring in proximity to the global centre of Sydney. Over the last decade (2001-2010), the City of Sydney Local Government Area, has been the largest and the fastest- growing Local Government Area in metropolitan Sydney[17].

Figure 4. Population change 1966-2051
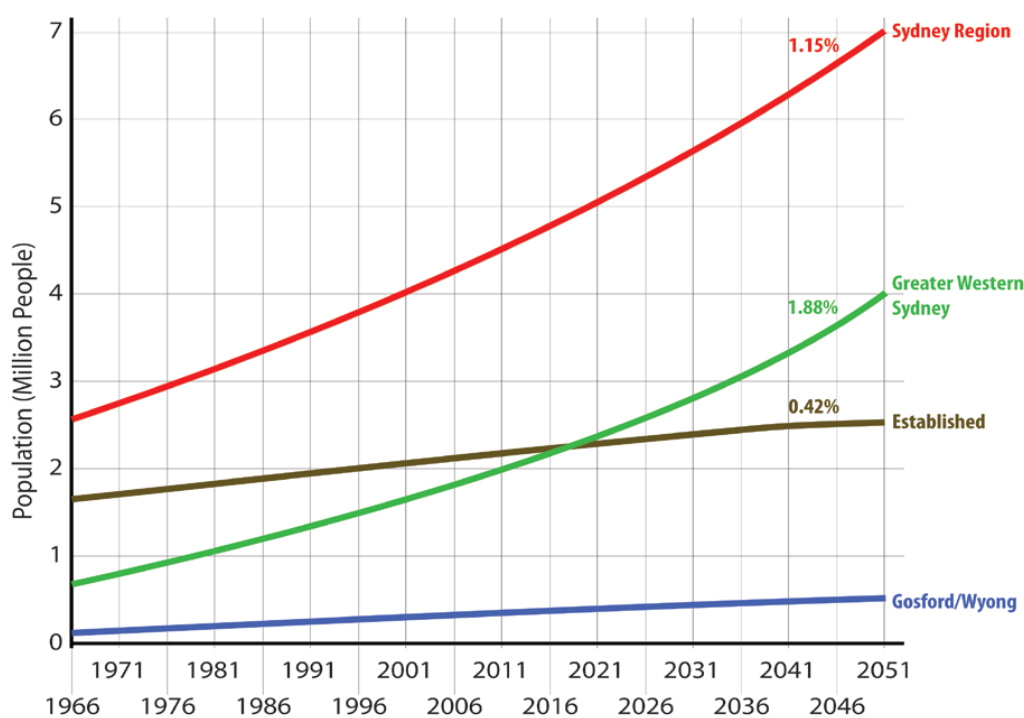
Source: Cox

A number of studies designate Sydney as Australia's global city, although all Australian metropolitan cities are increasing their global orientation[18]. Sydney's global status was based on the premise that the city's links with the global economy are the main driver for wealth creation and employment growth. These links include capital flows, airline services, international tourist flows, business interactions and global flows of knowledge and information. Over half of all international visitors come to Sydney. Sydney is a popular location for the regional offices of Australian-based foreign companies. The relationship between Sydney and the global economy, particularly the growth nodes of East and South Asia, provides the city with unique locational advantages.

Sydney's Gross Regional Product in 2008-09 was estimated at AUD 257.9 billion, representing around 25% of the Australian economy[19]. Globalisation was a major driver for growth over the past 30 years. Sydney emerged as a dominant national financial and business centre. The metropolitan economy became more specialised around a grouping of industry clusters such as finance and business services, information and multi-media, education, tourism and recreation. Since the onset of the Global Financial Crisis and global economic recession, the metropolitan economy has under-performed. Household debts are high, housing affordability remains unattainable for many residents, and retail is sluggish. The appreciation of the Australian dollar against major currencies has intensified global competition for Sydney's large manufacturing, tourism and education industries. Further, Australia's resources boom, driven predominantly by Chinese demand for Australia's mineral and energy exports, has resulted in what

is termed a two-speed economy. Although the national economy has benefited through high terms of trade, many economic benefits are concentrated in the northern and western states and territories, whilst the south eastern states, are growing at a slower rate[20]. The key question is whether the poor performance of the metropolitan economy is cyclical, due to higher terms of trade and a stagnating global economy, or if it is structural, with major challenges to strengthening industry competitiveness and to diversifying the metropolitan economy. Alternatively, and what appears most likely, is that Sydney's economic challenges are a combination of both.

Figure 5 shows a GRP projection for Sydney to 2036. The projections indicate Sydney's economy growing in real terms from AUD 256 billion in 2010 to AUD 488 billion in 2036[21]. In order to get anywhere near the ambitious GHG emission reduction targets, there needs to be a decoupling of economic growth and, in particular, energy consumption.

Figure 5. Metropolitan Sydney Gross Regional Product projections 2010-2036
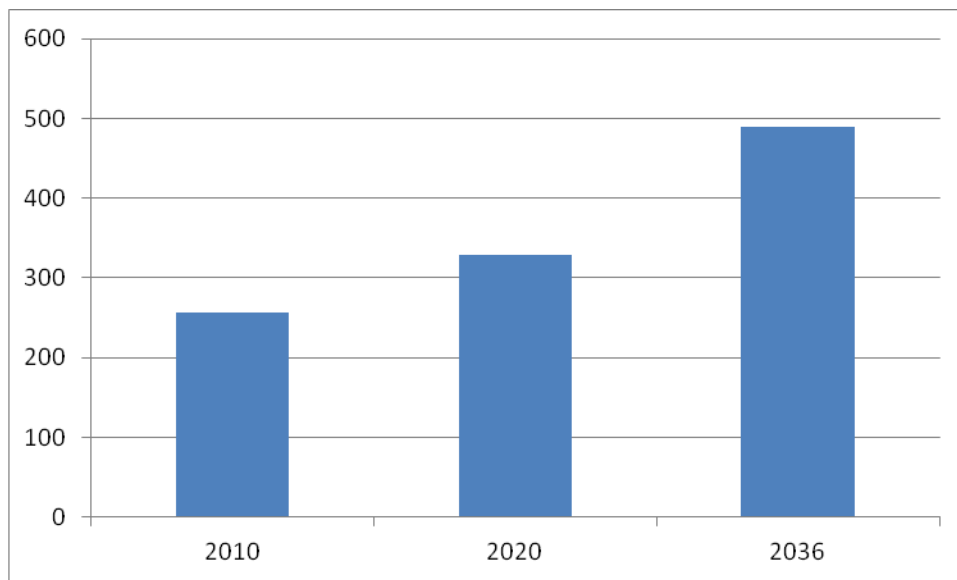
$ Australian billion 2010
Source: AEC, Australian Treasury, Strategic Economics

It is in this context that debate about the potential of new green industries, industry opportunities associated with a price on carbon and other sustainability policies, and new green skills and greening existing skills becomes important. There is intense political and policy debate surrounding the potential of the low carbon economy, with views ranging from those that argue that the competitiveness of major industries will be destroyed, to those that argue that the low carbon economy will be the next driver of economic prosperity for the national economy.

Over the past 30 years, the urban economy has undergone enormous sectoral and spatial change. Major drivers for change include globalisation, the growing complexity of global supply chains, growth and consolidation of finance and business services in central locations, de-industrialisation and restructuring of manufacturing, growth and decentralisation of retail and community services, massive growth in information and communications technologies and associated e-business.

Table 2 provides a snapshot of sectoral employment change over the decade 1996 to 2006, with total metropolitan employment increasing from 1.48 million to 1.65 million, a net increase of 170 000 jobs over this period. Commensurate with global city literature, the table indicates high growth in finance and

business service industries, which combined account for around 36% of all job growth. These forces, underpinned by policies such as trade liberalisation, resulted in major structural industry change.

Table 2. Sydney's employment change by industry 1996-2006

Industry	1996	2006	Change 1996-2006
Primary industries	12 068	10 154	-1 914
Manufacturing	199 156	182 174	-16 982
Electricity, gas, water supply	9 752	10 662	910
Construction	76 642	86 115	9 473
Wholesale trade	110 831	103 467	-7 364
Retail trade	191 518	219 525	28 007
Accommodation, cafes & restaurants	67 413	76 179	8 766
Transport & storage	75 491	87 473	11 982
Communication services	36 110	32 367	-3 743
Finance & insurance	96 917	117 018	20 101
Property and business services	195 022	235 851	40 829
Government administration	60 139	73 777	13 638
Education	99 475	121 355	21 880
Health and community services	138 584	169 565	30 981
Cultural and recreation services	40 342	44 037	3 695
Personal services	53 662	60 077	6 415
Other	17 708	20 987	3 279
Total	**1 480 830**	**1 650 783**	**169 953**

Source: Australian Bureau of Statistics

The changing structure of Sydney's economy, particularly the growth of service-based industries and restructuring of traditional manufacturing has, to some extent, dampened the rate of growth of GHG emissions. Most of Sydney's electricity is supplied from coal-fired power stations outside of the Sydney Basin, and hence not all electricity consumption is attributed to Sydney's households and industries. Further, NSW's largest energy-intensive industries, specifically steel and aluminium, are also located outside of Sydney (though still within the Greater Metropolitan Region) in Wollongong to the south and the Hunter Region to the north. Nevertheless, by global standards, Sydney's GHG emissions remain exceptionally high due to high dependence on relatively low priced coal fired power, high population growth rates, high private vehicle dependence and historic reliance on wasteful and energy-inefficient household and industry practices.

Structural change impacts the energy intensity of the economy. Strong growth occurred in relatively low carbon property and business services, associated with strong employment growth in real estate agents, IT and management consultants, legal services, accounting, and cleaning. Property and business services provide a high proportion of knowledge intensive services. Employment growth in these industries is concentrated around the Sydney CBD, but more of jobs are decentralising to suburban locations to support growing local demand. Finance and insurance also experienced solid growth. Some jobs have been rationalised, particularly in banks, but new specialised financial services grew, at least up until the onset of the Global Financial Crisis.

Health and community services contain high growth industries with employment spread right across the metropolitan area. Employment growth is dominated by employment concentrations in hospitals, as well as large numbers of people employed in nursing homes, GP medical services, childcare and non-residential care. Education is also showing solid growth, driven by increasing population, demand for learning and increasingly, education exports. Manufacturing continues to restructure, driven by global competition and technological innovation. Despite net employment losses, manufacturing remains the third largest sector in terms of employment and has strong links to other sectors such as transport and storage and business services. Retail is Sydney's largest sector and continues to grow, with employment continually dispersing to high growth areas of the city. In other sectors, transport and storage are showing strong growth, driven by a more open economy and more complex supply chains.

A report by AEC for Regional Development Australia Sydney, a government-funded agency with a charter to promote sustainable and just economic development of Sydney, provides useful data that could potentially guide action on climate change[22]. For 2007, the report highlights:

- 426 262 businesses were actively trading businesses in the Sydney Metropolitan Region, with almost a third involved in the property and business services sector, followed by construction (15.0%) and retail trade (10.4%).

- 136 500 businesses were active in the property and business services sector - with the majority of businesses self-employed or small companies and a smaller group of major corporations.

- The construction sector has a relatively low ratio of employment to businesses indicating a large number of self-employed builders and tradesmen.

- Almost 22 000 manufacturing businesses were located in the Sydney Metropolitan Region, employing approximately 165 500 people. This indicates that manufacturing firms, on average, are considerably larger than service sector businesses.

The next 30 years are likely to be very different from the past 30 years. Key developments that will impact the structure of the economy include:

- strong growth of China, India and other Asia-Pacific economies, which will have a major influence on the Sydney metropolitan and Australian economies;

- demographic change, including high rates of population increase, ageing and the continuing dependence on high rates of immigration;

- the global financial crisis, global economic uncertainty and its aftermath;

- intensification of global competition in service-based activities;

- increasing evidence of climate change;

- the possibility of real energy price increases associated with climate change and peak oil;

- the rapid shift to the knowledge economy, emphasis on product and service innovation and convergence of technologies; and

- increased demand for fresh food and growing concerns about food stability, resulting in renewed interest in protecting agricultural lands on Sydney's fringe.

Figure 6 sets out employment projections for Sydney to 2020 and 2036, indicating that metropolitan jobs are projected to grow from 2.1 million in 2010, to 2.4 million in 2020 and 2.7 million in 2036, i.e. a net increase of 600 000 jobs.

Figure 6. Metropolitan Sydney Employment projections 2010-2036
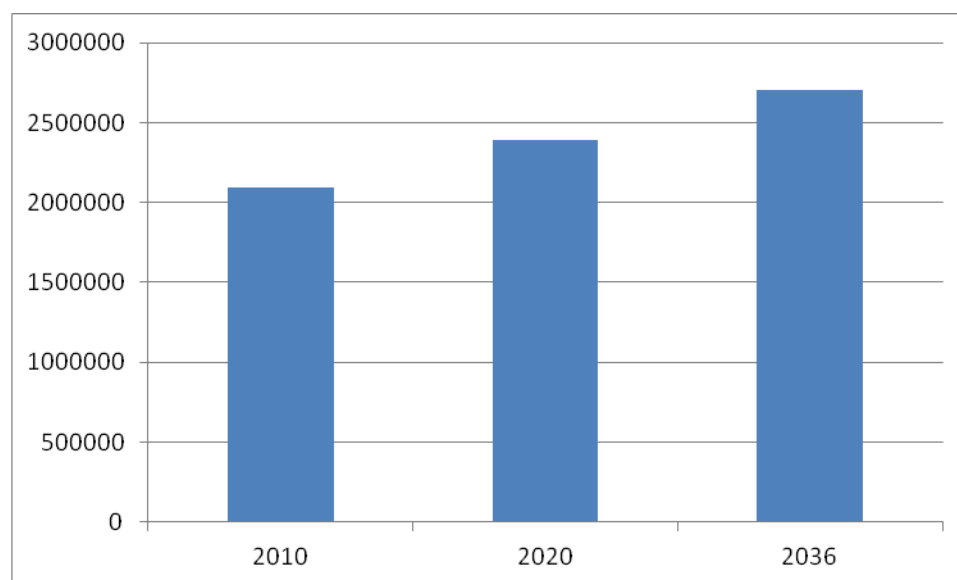
Source: NSW Government Transport Data Centre

Occupational dynamics

Table 3 shows metropolitan employment change in occupations over the period 1996 to 2006. Significant occupational trends include:

- Employment growth is averaging around 1.2% per annum, with professionals growing at more than twice the average rate (2.6%), and managers and administrators (2.2%) and associate professionals (1.8%) growing well above average.

- Employment growth in the metropolitan area over the decade 1996 to 2006 highlights the shift to the knowledge-based economy, with around 95% of net new jobs in advanced skill occupations – administrators and managers, professionals and associate professionals. In this context, advanced skill occupations are those involving substantial time in training and/or level of experience.

- Employment opportunities for tradespersons and related workers are declining, predominantly in manufacturing, as are opportunities for advanced clerical and service workers, mainly due to automation and, to some degree, global out-sourcing.

- The shakeout of low skilled labourers and related workers continues. On the other hand, growth of elementary clerical, sales and service workers is occurring, predominantly driven by population growth and increased expenditure in areas such as retail and hospitality.

Table 3.   Occupational change in Sydney 1996-2006

Occupations	Employment change	Compound growth

	1996-2006	rate
Managers and administrators	36 580	2.2
Professionals	94 695	2.6
Associate professionals	35 721	1.8
Tradespersons and related workers	-20 751	-0.5
Advanced clerical & service workers	-18 438	-2.6
Intermediate clerical, sales and service workers	32 624	1.3
Intermediate production and transport workers	-269	0.3
Elementary clerical, sales and service workers	16 524	1.4
Labourers and related workers	-6 641	0.1
Total	**170 045**	**1.2**

Source: Australian Bureau of Statistics

The metropolitan labour force is becoming more highly qualified. The number of people with advanced qualifications in Sydney is increasing rapidly. In 2006, 30.5% of the Sydney labour force, or 525 607 people, held a Bachelor degree or higher non-school qualification[23]. This compares favourably with 2001, when the proportion of the labour force with a Bachelor degree and above was 25.2%.

In the inner city, lower north shore and eastern areas of the city the proportion of the resident labour force with a Bachelor degree or above qualification is around 60%. Further, an increasing proportion of VET qualifications require more emphasis on IT, communication and problem solving skills. The growth of a knowledge-based economy has implications for skills for sustainability, as discussed below.

Industry, innovation and sustainability

Climate change mitigation and adaptation is spurring opportunities and challenges for Sydney's industries. This includes the application of new technologies to existing industries, the creation of new industries, and the phasing out of carbon intensive activities. The growth of technologies associated with greenhouse gas reductions includes those that reduce and replace carbon intensive technologies with low or non-carbon technologies.

The prospect of expanding low carbon investment and employment opportunities in Sydney depends in large part on the innovative capacity of strategic participants in the economy: firms, public sector, research organisations, and education and training providers. Innovations are defined as new creations of economic significance either of a material or intangible kind. Much of the debate regarding innovation is about the development of new products and processes, but innovation is more broadly concerned with a range of technological, behavioural, organisational and institutional changes that bring about broad benefits to society and commercial benefits to firms.

While private sector R&D is lower than OECD average, Australia has a good reputation in publicly funded R&D, particularly in basic research. However, Australia does have difficulties in transforming advanced research into commercial opportunity and business growth. This is where the importance of encouraging innovation and supporting commercialisation of R&D lies at the metropolitan and local level.

There is now a considerable literature on sub-national systems of innovation, especially at the city and regional level[24]. City characteristics, notably size and diversity, are important since innovation comes from interactions between populations diverse both in people and firms. The argument is that the greater the size, the greater the diversity[25]. The geographical clustering of complementary firms and organisations can

spur innovation. This includes knowledge-based industries such as finance and business services, design and creative firms, as well as information communications technologies and innovative precincts such as science and technology parks.

Figure 7 sets out a conceptual framework to analyse innovation at the Sydney metropolitan level[26]. It indicates four major sources driving innovation: government and regulation, industry, knowledge providers and users, the latter including households. This framework should guide action at the metropolitan and local level to increase opportunities for investment and jobs. As a driver for innovation, the diagram emphasises the importance of on-going interaction, not just between scientists involved in high level R&D, but also between all participants in relevant areas of the economy. The process of innovation in metropolitan Sydney will not so much rely on "big science" solutions but continuous improvements in all areas of the economy. Extensive learning is required in R&D, product and process design, production, using, adaptation and maintenance. Learning by doing and learning by using are key drivers of further innovation.

Figure 7. Major sources driving innovation
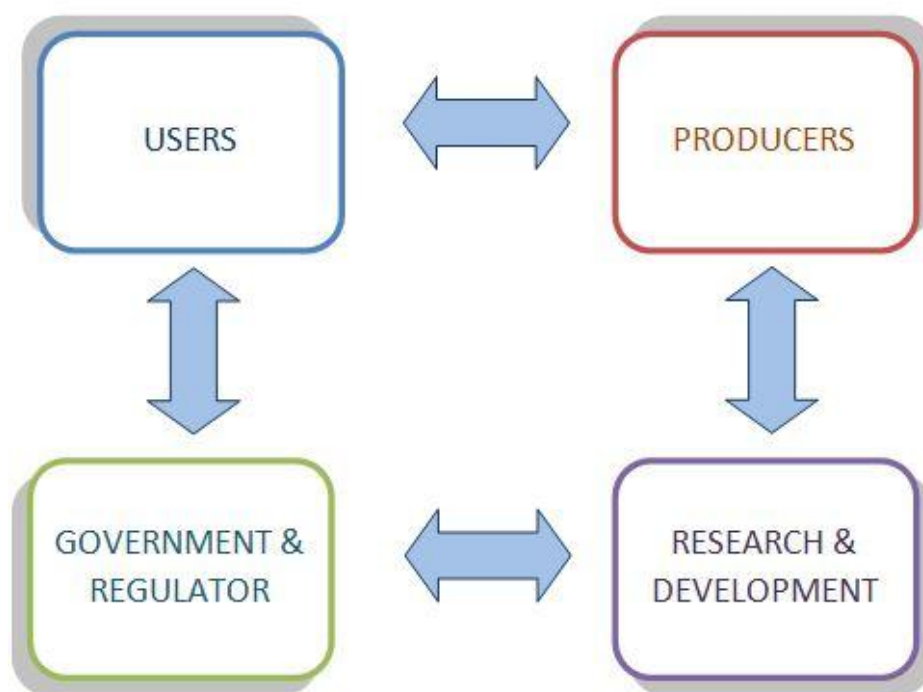
Feedback mechanisms are critical from customers, maintenance and technicians to drive new incremental innovations in products and processes. In relation to emission reductions, these feedback loops are continuous as firms and organisations across supply chains strive to reduce carbon intensive energy, integrate product cycles and product use, and maintain and re-use existing materials and products[27]. The challenge for Sydney is how to strengthen knowledge interaction and feedback between participants to drive innovation. Important initiatives include improving information and knowledge flows between participants and global linkages, fostering centres of excellence that diffuse technologies and build stronger partnerships between participants, not just on the supply side, but involving customers, public sector and smaller firms that are normally locked out of the innovation processes.

Some cities are more successful at capturing the benefits from innovation than others, and the Sydney metropolitan economy does have strengths and opportunities that support innovation. There are many advantages associated with strengthening local and metropolitan wide innovative capacity in response to

climate change mitigation and adaptation initiatives. Firstly, firms seldom innovate alone. To be successful, they rely on constant interaction with suppliers, customers and competitors. In many of the emerging sustainability industries, which integrate technologies and expertise across different industries and occupations, ongoing interaction, including face-to-face interaction, is critical. Secondly, the city's infrastructure, including research and education, broadband and transport, as well as local infrastructure such as technology and business parks, provides the enabling environment for innovation to occur. Thirdly, to be effective, innovation initiatives in response to climate change will need to drive change across the whole economy. This will only occur if knowledge and learning about sustainable technologies and practices are diffused across the economy. For this to happen, there needs to be a focus on strengthening collaboration between firms, government, councils and households at the local level. Sydney is looking at ways to strengthen collaborative initiatives across local area.

Moreover, Sydney has a number of opportunities to expand investment and jobs in existing and emerging industries. In 2010, the NSW Government commissioned a report on business opportunities in a low carbon economy (see Table 4)[28]. The report identified eight industry opportunities for the state, which by 2020 could achieve a market value of between AUD 6.8-10.9 billion annually, an average growth rate of around 23% per year, and the potential to generate up to 50 000 jobs. Most of these activities will be concentrated in Sydney, with the possible exceptions of wind energy and business services.

Table 4.   NSW Business opportunities from a low carbon economy

Sector	Description	Employment (full time equivalent) 2020
Grid solutions	Infrastructure, products and services that support energy transmission and distribution, upgrade the electricity grid, expand capacity, improve efficiency and allow connectivity with intermittent sources of energy such as renewables.	360-680
Green buildings	Technologies and designs that reduce the consumption of energy in the construction and on-going lifecycle of buildings	17 110-20 530
Waste conversion	The removal of substances, materials or energy out of discarded materials or waste	1 250-1 620
Low emissions vehicles	Low carbon fuels, technologies and infrastructure requirements for the introduction of low emissions vehicles (LEVs), including alternative power vehicles, alternative fuel vehicles, and more efficient internal combustion engine (ICE) vehicles.	3 780-4 540
Solar energy	The generation of energy using Solar PV or concentrating solar thermal technologies to convert solar radiation into electricity.	1 350-2 030
Wind energy	The conversion of wind energy to a useful form of energy, such as electricity, through the set up and operation of on-shore wind turbines and farms.	2 740-5 990
Geothermal energy	Convert geothermal reserves to heat in the ground to energy via conventional or enhanced geothermal systems.	0-2 500
Business services	Legal, accounting, finance and project management and other technical and consultancy services that have grown from a carbon-constrained economy.	2 950-12 150
Total		29 540-50 040

Source: Ernst & Young

A survey of Sydney firms in different industries was undertaken for the OECD Sydney project (Box 2). The survey demonstrates that a high proportion of firms are investing in green technologies and skills, and creating new jobs.

Box 11. Sydney Business Survey

A survey of Sydney businesses, undertaken by the project, highlights the growing importance of sustainability in changing business awareness and behaviour with particular emphasis on training.

- 80 responses across a range of industries.

- 31% of responses from small business, 36% from medium businesses, and 33% from large businesses.

- Across the respondents, significant changes have been made to production (57%), Suppliers (60%), purchasing (66%) and marketing (63%) in response to sustainability practices.

- The main reason for these changes has been environmental awareness (71%).

- 34% of respondents have stated that sustainability changes have created new jobs, whilst 55% have stated that the changes have transformed existing jobs

- More than 250 jobs have been created from the (80) respondents.

- More than half the respondents have indicated that there is at least some need for new skill-sets in the new green jobs.

- More than 60% of respondents undertook training in response to new regulations or requirements, and over three-quarters undertook training due to anticipated future needs or business opportunities.

- Training was spread across a range of internal, external, formal and informal providers.

- The main reasons for not undertaking training were costs and unavailability of training.

- The main outstanding needs for businesses are funding for training (60%) and exposure to new market opportunities (45%).

- More than half the respondents were intending to make sustainability changes to their services or operations in the near future.

- The highest need for future skills will be felt in the technical, management and green occupations (all over 60%).

- Respondents see energy efficiency as the highest need for new green skills in the near future (88%).

- A significant number of respondents are intending to undertake training across a range of business areas.

- More than half the respondents are expecting to encounter difficulty in recruiting staff with the right skills sets.

Skills for sustainability

Factors driving skills demand for sustainability include the policy and regulatory environment, market forces such as energy costs and competition, and successful innovation around renewables and energy-efficient technologies. The Australian Government has identified the carbon price as the prime catalyst for industry growth and restructuring, with significant impact on demand for skills. Skills for sustainability are acquired from many sources. This includes the formal education and training system at secondary and tertiary levels, learning while doing through research and workplace experience, web-based learning and learning from industry agencies, trade magazines, supply chains and competitors. More employers are

acquiring ISO 14001 accreditation, resulting in more internal and external training for green skills. Community based learning is also becoming important, particularly amongst young people.

Green skills policies and programmes are still at an early stage. The national and state policy frameworks are in place, and a plethora of initiatives are being implemented by employers and educational and training organisations. However, it will take time before the results of these initiatives can be fully evaluated. To date, no comprehensive programme of work has been undertaken to identify demand for green skills in Australia or, by extension, whether supply is exceeding demand. However, it is important to anticipate the needs of such skills in the labour market in order to ensure that the supply will actually meet the demand.

The capacity of Sydney to make a successful transition to a low carbon economy is heavily dependent on skills. Within this context, in 2009, the Council of Australian Governments (COAG) signed the Green Skills Agreement (GSA) to ensure that skills for sustainability are an integral component of all vocational education training[29]. As defined by the COAG GSA[30], these include technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community. Initiatives are being implemented under the Green Skills Agreement Implementation Plan which was presented to the Ministerial Council for Tertiary Education and Employment (MCTEE) in June 2010. The focus is on skills in emerging industries and occupations (as analysed in Chapter 2), as well as on improving sustainability skills within existing skills and occupations. In fact, the most cost effective measures to reduce GHG emissions involve skills to do things differently in existing industries such as construction and manufacturing; and existing occupations such as plumbers, electricians, designers and mechanics. A lot of focus on new skills will be within existing enterprises.

Indeed, skills are important drivers of innovation. During the invention stage, entrepreneurial and technical skills, as well as R&D capacity, are required to mobilise resources and to build and test proto-types. At the production stage, skills are required in the design of capital goods, processes and manufacturing. At the diffusion stage, skills are required in understanding new technologies and standards, adapting these for existing products and systems, maintaining, re-using and re-cycling, eliminating waste, and interacting with users to meet their specific requirements[31].

An Australian Industry Group (AIG) report[32] suggests that emerging technologies will be increasingly important in the next 5-10 years, including environmentally driven emerging technologies and convergent and multi-disciplinary emerging and enabling technologies. To meet industry skill demand, the Australian Government recognises and supports industry-led Industry Skills Councils (ISCs) through the Department of Education, Employment and Workplace Relations (DEEWR). The government provides funding to ISCs to carry out their work, and collaborates with them to identify industry skills and workforce needs, and link these to the training system and programme provision. The ISCs have a central role to play in the implementation of actions emanating from the Green Skills Agreement and other sustainability policies at an industry level. These Councils cover major sectors of the economy, such as construction and property services, manufacturing and agrifood, and are governed by industry-led boards. They advise governments and enterprises on workforce development and skill needs.

The Industry Skills Councils have released a report on environmental sustainability in different sectors of the economy[33]. The report argues that vocational education initiatives must be industry specific, appropriately timed and add value to enterprises, rather than placing more burdens on them. It emphasises that the majority of skills will not be entirely new. As shown in Table 5, many training packages have always contained strong sustainability components, such as competitive manufacturing and water management. Many emerging skill requirements include monitoring, auditing, risk management and reporting and design skills.

Table 5. Focus on Green Skills in selective industry training packages

Industry Council	Green skills
AgriFood Skills Australia	80% of AgriFood Training Packages contain 'green' skills Caring for Country policy targets 42,000 farm managers to improve sustainability practices Rural Water Use and Infrastructure Program aims to improve skills and knowledge of land managers in water use efficiencies. Increasing demand for organic farming training
Construction and Property Services Industry Skills Council	More stringent environmental codes increase demand for professional facilities managers, to manage 'green' buildings and facilities. Workforce needs higher skill levels to manage these sophisticated building services. Growing professionalization of Accredited Building Sustainability Assessors to deliver home sustainability assessments, with new skills in building sustainability measurement, design and advice With increased building code standards relating to energy efficiency, relevant training in energy efficiency design and construction will continue to gain prominence.
ForestWorks	Green skills incorporated in Forest Products Industry Training Package Training package to explicitly address sustainability skills regarding resource efficiency, minimising water usage, recycling and the use of biofuels.
Innovation and Business Skills Australia	New industry certification programme, Sustainable Green Print, to assist businesses to introduce environmentally sustainable practices Increased demand for Corporate Social Responsibility Managers, qualified at Diploma or Advanced Diploma of Management level, including Business Continuity and Sustainability units. New 'green jobs' may include carbon measurement and carbon auditors. Development of a two unit skill set – the Sustainable Practice Skill Set – to provide VET practitioners with the skills, knowledge and base accreditation to deliver skills for sustainability training and integrate sustainability into programmes.
Manufacturing Skills Australia (MSA)	All qualifications in Training Packages now include a core sustainability unit of competency. Development of new cross-industry qualifications and units of competency in specialist fields, such as environmental monitoring and management, pollution control, waste and energy management, and remediation or rehabilitation activities. Draft Certificate IV and Diploma in Environmental Monitoring and Technology, and a Graduate Certificate in Environmental Management. Will enable workers to measure and address enterprise impacts on air, water and other external environmental conditions. Development of the MSS11 Sustainability Training Package, a new dedicated training package to help the manufacturing sector achieve sustainability.
Transport and Logistics Industry Skills Council	Transport and Logistics Training Package to incorporate the requirements for flexibility and embedding of 'green skills'.

Source: Industry Skills Council (ISCs) and Department of Education, Employment and Workplace Relations (DEEWR) Australia

One of the key questions that will influence Sydney's capacity to attain ambitious carbon reduction targets is whether the city builds on the current skill base or whether there is a paradigm shift towards a knowledge based building and construction sector, transportation, renewables and a more decentralised energy generation sector. The latter would require a significant increase in higher-level knowledge based skills in a range of areas, including design, software, and electronics, as well as increasing customised solutions. In relation to the paradigm shift based in technology, it is important to link advances in R&D (e.g. photovoltaics and smart houses) with investment in human resources to acquire new skills. The Australian Industry Group (AIG) is concerned that there is a lack of comprehensive skill development pathways for the emerging technology sector, with sustainability one of the key areas. Two key findings of an AIG report[34] on emerging technologies relevant to sustainability are:

- The high level of convergence and inter-disciplinary nature of emerging technologies has implications for the vocational education and training sector; and

- Rapid change requires an adaptable, flexible and creative workforce, requiring a commitment to the continuous upgrading of skills.

New technical skills are also required in new industries, such as the installation of grid connected photovoltaic systems. The report argues, in relation to construction for example, that the design and construction of energy-efficient buildings is emerging as a major driver for skills, including the design of new buildings and components, as well as the installation of new technologies and retrofitting or upgrading of current or old technologies. Skill demands vary, with some tasks requiring a variation of existing skills whilst others require a set of new skills and knowledge, as well as integration of skills from different trades, such as electrical and plumbing skills.

In response to the sustainability agenda, all new training packages must include a sustainability component. Sustainability has become a high priority training area for the community-based Registered Training Organisations (RTOs). Interest in sustainability skills is also increasing in most disciplines. A report on energy efficiency courses suggests that there is a wide range of courses nationally relating specifically to energy efficiency and others that include some components of energy efficiency[35]. The report estimated there are 22 national training package qualifications, which included some components of energy efficiency, as well as 30 state accredited VET courses and 62 courses run by industries. In NSW, more than 7% of all students enrolled in TAFE NSW were participating in green skills training, well above the 5% target for 2013[36].

The education and training system confronts a number of challenges in meeting the demand for sustainability skills. The system needs to be flexible to respond to the rapidly changing regulatory and market environment. Some RTOs emphasise the importance of incorporating energy efficiency principles into existing courses and a number of units of competency, whereas others are looking towards the design of new qualifications based around specialisations in energy efficiency. Four key challenges are described below.

Improving teaching skills

One important issue is the quality of teaching skills in sustainability. In relation to emerging sustainability skills, many teachers and trainers must continually upgrade skills just to keep up. In many cases, best practice enterprises are much more advanced than the education and training system in developing sustainability solutions in new projects and then incorporating lessons into subsequent projects[37]. Emphasis needs to be given to continually upgrading the skills of teachers, through professional development, improvements in web-based training material and exchanges between industry and the education and training system. Conscious of this, an objective of the COAG Green Skills Agreement (GSA) is the up-skilling of VET practitioners so they can provide effective training and facilitation in skills for sustainability. Under this objective, a national professional development programme will be delivered in 2012 to provide VET practitioners with the skills, knowledge and base accreditation they need to effectively deliver skills for sustainability training. The Australian Government also has funded the development of a suite of teaching, learning and online resources to support delivery of professional development programmes for VET practitioners nationally.

Increasing engagement of young people in sustainability

The NSW Department of Education and Communities designated 2010 as the Year of Learning for Sustainability for NSW Public Schools. Although it is too early to assess the result of the commitments to

green skills, some positive outcomes can be mentioned. In general, young people have a high awareness of environmental sustainability. Primary schools give a lot of attention to providing young people with knowledge about climate change, including values associated with sustainability. In secondary schools, sustainability education tends to be more specialised, with units in science and geography.

The Dusseldorp Skills Forum, a not-for-profit think tank involved with young people, undertook a national survey of apprentices and trainees in 2008 and 2011[38]. Results of the surveys include:

- employers and teacher/trainers are still the main source of learning about skill areas and TAFE remains the main source of learning about sustainability skills;

- the take-up of green skills in workplaces and courses increased significantly over the three-year period;

- the number of apprentices and trainees who have not learnt about sustainability dropped from 36% to 19%; and

- apprentices and trainees have a high level of personal interest in sustainability skills and a strong recognition of the professional relevance of these skills, but this is confounded by a lack of guidance and incentives from employers, the market and educators.

Programme design and implementation

An understanding of skill requirements is an important component of well-designed public climate change programmes. Lack of training can be costly. For example, in response to the onset of the Global Financial Crisis, the Australian Government rolled out the Home Insulation Program (HIP) with the aim of insulating 2.7 million houses. The twin objectives of immediate economic stimulus and improving energy efficiency were not compatible, with the haste to release the funds not conducive to the careful planning required to implement a large national programme. Lack of training contributed to a number of accidents, including four fatalities and one hundred house fires[39]. The New South Wales government initiated a safety audit of solar panels after a local audit found a high proportion of rooftop installations to be faulty[40].

Diffusion of skills throughout the economy

Much of the debate about green jobs and green skills is concerned with "big science" solutions, involving substantial allocation of resources to R&D into coal sequestration, geothermal, solar and wind technologies. All these emerging areas are important, but the take-up and adaptation of technologies and practices is a key issue that has not been sufficiently emphasised.

This requires a major and ongoing commitment to skills upgrading to manage the transition to a sustainable economy. In a landmark report on skills for sustainability[41], a key finding was that, "in order to be effective, implementation of climate change strategies requires a broad skill set and mechanisms to diffuse knowledge about sustainability technologies and practices across the economy. Up-front investment in R&D is necessary although not sufficient. More emphasis needs to be given at all levels of the economy, not only in research laboratories".

The vocational education and training sector has a crucial role to play in diffusing skills throughout the Sydney metropolitan economy. The metropolitan TAFE Institutes, in particular, are expected to play an increasingly important role at the local and regional level in accelerating the take-up of new technologies and skills, overcoming skills barriers, and diffusing best practices. The ability of TAFE to play this leadership role depends, to a large extent, on the strength of their partnerships with industries, communities

and state and local agencies, specifically small and medium-sized enterprises. This is consistent with Skills Australia's view of the role of TAFE, which states:

> The extensive public infrastructure and capability of the TAFE system is a platform for regional economic development. It is characterised by the leadership role of industry in its development and governance, and the special partnerships between enterprises and providers.[42]

The importance of metropolitan and local initiative

Sydney requires action at the metropolitan and local level. There is no metropolitan development agency and no agency responsible for reducing climate change at the metropolitan level. Nor is there a coherent policy framework to support initiatives at the local level. Given the size, complexity and diversity of Sydney, one way to proceed would be to delineate sub-regions within Sydney where local governments, business and communities could work to address problems.

The Metropolitan Strategy designates 10 sub-regions within Sydney. Given the importance of skills, an alternative is to consider the catchment areas of the metropolitan institutes. Figure 8 shows the geographic spread of the four metropolitan TAFE institutes. The Sydney Institute is at the core of what has been termed global Sydney. Its catchment incorporates Australia's premier finance and business hub, Sydney Airport and Port Botany, and a combination of higher density and established and predominantly gentrified areas. The Northern Sydney Institute covers a number of strategic centres and Australia's premier business park at Macquarie Park, as well as high income settled residential areas and the northern beaches and suburbs. The North Sydney precinct within the Northern Sydney Institute is an extension of the CBD. Western Sydney and South Western Sydney are two large and rapidly growing suburban areas, with strong manufacturing and logistics, and increasing advanced services capabilities.

Figure 8. Metropolitan Institutes

Figure 9 provides estimates of GHG emissions for each of these catchments, ranging from 10.3 Mt CO_2-e in Northern Sydney to 18.7 Mt CO_2-e in the Sydney Institute catchment. Western Sydney (11.8) and South Western Sydney (15.2) are expected, under business as usual scenarios, to generate the most significant increases in GHG emissions, due to the increasing energy consumption of new households, industry growth and private vehicle kilometres travelled.

Figure 9. Green House Gas Emissions by sub-region MtCO2-e (2008)
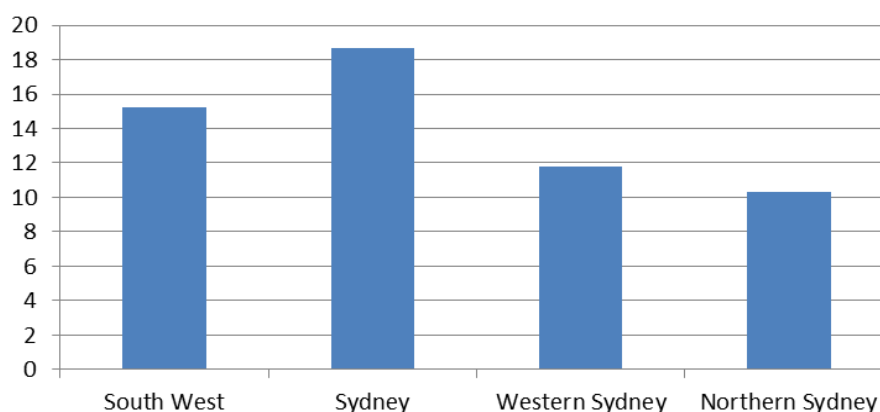
Source: Arup

Role of metropolitan TAFE institutes in building a sustainable metropolitan economy

Vocational education plays a central role in meeting the training demands of industry and students. Across NSW there were 583 200 enrolments in vocational education and training institutes in 2010. Australia is recognised for its world-class vocational education system with a reputation for quality teaching and learning outcomes. Accredited training is provided by public, private and community-based Registered Training Organisations (RTOs). Key agencies involved in vocational education include the publicly owned NSW TAFE, as well as an increasing number of industry providers and community based accredited registered training organisations. The RTOs operate in an increasingly competitive training market. The four metropolitan TAFE institutes, the public training providers, contribute around 75% of all vocational training in metropolitan Sydney, and account for around 250 000 enrolments.

Sydney is experiencing high demand for sustainability education and training to provide the skills needed for a more sustainable economy. Although not the only vocational training providers, the metropolitan TAFE institutes have a central role in developing Skills for Sustainability. TAFE is well positioned to expand its role in the diffusion of sustainability skills to industry with more emphasis on working with local governments, regional agencies, and SMEs.

Sydney's metropolitan Institutes are making significant contributions to sustainability skills through the provision of green skills courses, audits and actions to ensure best practice outcomes in all campuses, and training and recruitment of teachers in green skills. The metropolitan institutes have demonstrated their capabilities in response to climate change and sustainability policies. Some of the findings of OECD Sydney project workshops include:

- The vocational education and training system is capable of responding quickly – e.g. Industry Skills Councils, TAFE, Green Skills Programmes – but more emphasis needs to be given to implementing and adapting at local level.

- Most of the attention to new initiatives is on the supply side. More attention needs to be given to the demand side, particularly to addressing the barriers associated with skills for sustainability, including lack of information, lack of management skills, and perceived high costs of training. The "skill ecosystem" approach addresses this issue (see Chapter 3).

- New courses are required in sustainable technology design, production, management and maintenance that link Vocational Education and Training (VET) and Higher Education (HE) levels.

- More emphasis is also required on entry-level jobs and skills.

- Education and training at the local and sub-metropolitan level needs to be more closely aligned with economic strategies that are creating investment and job opportunities in the low carbon economy. More emphasis needs to be given to TAFE Institutes, which can act as a group in a robust way in terms of linking with industry. The difficulty with local government is that it needs a forum for Local Councils to form a critical mass and state 'this is what we demand' (e.g. goods movement).

- More emphasis needs to be placed on community-based initiatives. There needs to be a deep engagement of Sydney residents and businesses, with vocational and education providers working with Regional Development Australia Sydney (RDA) to organise forums, workshops and research that builds on metropolitan and local innovation and skills initiatives and links them to broader issues of social and economic sustainability.

Diagnostic SWOT analysis of Sydney

From the previous analysis, it is clear that Sydney is well prepared to face climate change in terms of policies and programmes in place. Several adjustments are already taking place and some of the challenges ahead in terms of labour market needs and economic development have been identified. However, a number of opportunities are arising as the global discussions on alternative measures to mitigate and adapt to climate change evolve. Table 6 provides a summary diagnostic of the metropolitan economy in relation to climate change. This analysis is further expanded in the rest of the report.

Table 6. SWOT analysis of Sydney and the green economy

Strengths	Weaknesses
Business and community awareness regarding climate change	Loss of industry capability and local ownership to increased competitiveness e.g. photovoltaic manufacturing.
Advanced economy with strong technological capabilities and skills base	Low take-up of technologies and poor skill base in SMEs
Strategic framework for skills for sustainability at national and state level	Lack of world class research and demonstration facilities linked to local industry
High-level research base.	Under-resourced local government (with City of Sydney an exception)
Global competitiveness in up-front areas – architecture, design, some software, project management, finance and evaluation.	Under-resourced regional economic development agencies
Advanced VET and higher education system	Dominant energy system organised around cheap coal fired power generation
Sydney's large economic base including a dense network of global industries, well-developed infrastructure, good governance, and quality amenities and living environment.	
Opportunities	**Threats**
Convergence of industries, occupational disciplines and technologies to provide sustainable solutions (e.g. smart houses)	Vacillations in climate change policy, undermining credibility and long term low carbon investment
Establish innovation networks linked to training	Vested interests impede change and resistance to higher energy prices
Diffuse best practice experiences from industry leaders	Lack of policy innovation results in slow take-up due to

Improve metropolitan governance of sustainable economy transition through vertical integration (central and local agencies) and horizontal partnerships (industry, education and training providers, households and local government).	inability to remove barriers (legal, institutional, market failures)
Strengthen relationship between sustainability and innovation policy	Energy authorities forced to maximise commercial returns, not environmental benefits
Software development to improve sustainable precinct planning and development	Focus on narrow high tech opportunities, rather than broad based industry and skills upgrading strategies
	"Lock in" to the wrong technological and industrial development trajectory
	Lack of support for local and regional initiatives slows diffusion of best practice technologies and skills.

Prospective actions

The key message from the OECD Sydney project is the importance of building linkages and strengthening collaboration at a metropolitan and local level to support the transition to a low carbon economy. Prospective actions to achieve this goal include the following:

1. The parties should work towards an agreement with the aim of supporting and implementing initiatives to increase employment and the skills required to support the transition to a low carbon economy in metropolitan Sydney.

2. The establishment of an entity, *Sustainable Sydney Partnership*, with the involvement of industry, state and local government, that can articulate a vision for a low carbon metropolitan economy, organise activities and events, strengthen relationships and initiatives with cities throughout the Asia-Pacific region, and promote Sydney as a low carbon economy.

3. Collaborate and seek support from industry and government for the development of an action based Sustainable Economic Strategy for Sydney, which identifies emerging sectors and industries, technology and skills, and collaborative actions to grow these opportunities.

4. Strengthen global relationships for sustainability, particularly in the Asia-Pacific region, including working with the OECD, and linking with Global Connect and other international platforms in order to facilitate and promote international flows of knowledge and organise events in Sydney to promote sustainability technology, practices and education.

5. Work within the framework of the current Sydney Metropolitan Plan 2010 and collaborate with local government and industries at the local and sub-regional level to integrate the economic and sustainability outcomes associated with the City of Cities (which is centred on increasing employment and high skilled opportunities in strategic employment areas across metropolitan Sydney).

6. Encourage investment and upgrade skills in green infrastructure, particularly integrating waste, water and energy efficiency and, through the City of Sydney, encourage diffusion and awareness of best practice trigeneration with investors, energy agencies and developers across the metropolitan area.

7. Expand opportunities to develop the sustainability agenda around innovation, with attention to establishing innovation networks, promoting demonstration projects, diffusion of best practice energy efficient projects, partnerships with energy distributors and retailers, knowledge exchange with leading sustainable cities and industries, and expansion of online learning opportunities.

8. Foster innovation with sustainability centres of excellence and state centres across the VET system in Sydney, including TAFE institutes collaborating to support greater specialisation and closer alignment with research and higher education institutions.

9. Identify and work with other stakeholders to establish a Renewables and Energy Efficiency Working Group and approach the NSW Government to develop industry and skills strategies to maximise investment spinoffs and skills associated with attaining the national 20% renewables target by 2020.

10. Work with government, industry and unions to establish sustainable industry networks in metropolitan Sydney amongst small and medium-sized enterprises in selective industries in building and construction, manufacturing and business services with the aim of providing opportunities for project identification, technological and product innovation and effective and low cost skills upgrading.

11. Implement community based initiatives aimed at increasing sustainability literacy in schools, community networks and households through the extension of accredited and non-accredited short courses, and strengthening articulation and pathways through secondary, vocational and higher education.

12. Develop new initiatives, in partnership with local government and employment service organisations such as Job Services Australia, to support disadvantaged people to gain access to learning and job opportunities in sustainability tasks and occupations and, in particular, improve opportunities for entry level jobs.

13. Design and implement, in partnership with government and industry, a communications strategy to promote an identity of Sydney as a sustainable city, along with the values, attitudes and skills associated with a low carbon economy and the employment opportunities associated with the transition.

14. Promote the VET sector as a leader in sustainability learning, continually strengthen teaching capabilities and demonstrate the adaptability of Sydney's VET training packages at a local level to meet local needs and demands.

CHAPTER 2.

SYDNEY'S LABOUR MARKET IN THE GREEN ECONOMY

By Kris Krasnowski

Abstract

This chapter explores the functioning of Sydney's labour market and then considers how well placed Sydney is to make the transition to a low carbon economy through a labour market lens. In particular, it summarises the key international policy debate before setting out a broad analysis of Sydney's economy, the labour market and the potential for "greener" jobs. It finishes by providing an analysis of the labour market and a series of recommendations to aid Sydney's transition to a low carbon economy.

Policy issues

A new economic paradigm?

Economies across the world are now beginning to emerge from the (initial) fall in output that was the result of the 2008 global financial crisis. However, global economic uncertainties persist following what is sometimes referred to as the *Great Recession*.[43] Low growth and higher unemployment is profoundly affecting many economies (e.g. USA, UK and Southern Europe). The *Great Recession* is likely to alter the way in which academics and policy makers think about how best to deliver economic growth in the years ahead. This has led leading economists and experts to explore to what extent economic growth alone should be seen as the ultimate goal, and whether other measures of success, such as happiness and environmental sustainability, should be incorporated as part of a wider more sophisticated measure of economic and social progress.[44]

More specifically in relation to the "Green Growth" agenda there have been a number of significant studies that suggest early and strong action is needed to tackle climate change, and acting earlier will, in the long run, be cheaper and more efficient. For instance, the Stern Review estimates that an investment of 1% of global GDP per annum is required in order to mitigate the worst effects of climate change, but failure to act could result in global GDP potentially being 20% lower than it might have been.[45] In Australia the Garnaut Climate Change Review also suggested that the Australian economy had more to gain by acting strongly to mitigate climate change than maintaining the current status quo, which could have devastating medium to long-term economic and social effects on the country.[46]

It is examples such as these, and the cross political party support that they received, that highlight the growing importance of climate change mitigation strategies as components of 21st Century growth models. The OECD, in its interim report of the Green Growth Strategy, suggests that "*...the environment and economy can no longer be considered in isolation*". It is precisely this willingness to look beyond the conventional drivers of growth, integrating action to tackle climate change and increase environmental sustainability with future economic growth models, which represents an enormous opportunity to deliver "Greener Growth" at a local, national and global level.

New "green" jobs or "greening" of existing jobs

In terms of the labour market impact, it remains to be seen how and to what extent jobs will be created, destroyed or evolve as economies shift to greener growth. In some instances the transition to green

growth will result in the creation of new jobs as new technologies and products emerge. However, it is also true, and perhaps more likely, that existing jobs will evolve into "greener" jobs as the requirements of the economy (and jobs) adapt, driven by changing consumer demand, government regulation and technological and market innovations. Irrespective of the definition, it is almost certain that many existing jobs and workplaces will begin to adapt to incorporate sustainability practices in the workplace, and that the skills the economy needs will change too, as green growth becomes the goal of governments, businesses and communities and environmental sustainability is incorporated into everyday life.

Box 12. Not just green jobs but quality green jobs

Whilst much of the debate is rightly focussed on the types of jobs that are likely to emerge, it is also important to consider the "quality" of the new or evolving employment opportunities. There is no standard or agreed definition of "quality work". Most studies tend to adopt and suggest a range of measures that frequently include specific characteristics of the job (e.g. pay, hours of work, skill requirements, job content) or the wider work environment (e.g. working conditions, access to training, career prospects and health insurance/cover).

A range of international institutions and organisations have developed frameworks and indicators to measure quality work. For instance the ILO created the concept of 'decent work' in 1999 and the European Union created ten dimensions of "quality of work" in a Communication in 2001. More recently a global Task Force led by UNECE has developed a conceptual framework for measuring the quality of employment. This renewed focus on quality is pioneering a new approach to work and it is important that future labour market developments in the green sector remain true to the spirit of this policy shift.

Sources :
Clark (1998), Measures of job satisfaction, What makes a good job? Evidence from OECD countries, OECD
ILO decent work agenda
European Commission Communication, (2001), "Employment and social policies: a framework for investing in quality"
United Nations Economic Commission for Europe (UNECE), (2009), 'Introduction of the conceptual framework for measuring the quality of employment'.

Inclusive green growth

The transition to a low carbon economy will result in challenges and opportunities, and almost certainly result in winners and losers. Lessons from recent history in relation to globalisation suggest that public perceptions matter and can have implications on the extent to which successful structural adjustments occur. Ensuring green growth is inclusive and managed effectively is essential if public support is to be maintained.

Times of structural change often lead to uncertainty and apprehension. It can have major impacts on people's lives and careers, breaking the old certainties, which can lead to insecurity. Structural changes can also lead to the demise of unprofitable or environmentally unsustainable sectors and can have particularly large and concentrated impacts in certain geographic areas or on specific occupations that rely on high carbon intensive industries. Effective adjustment policies need to be introduced in order to smooth the transition to greener growth. For instance, workers in high carbon intensive and related industries where jobs are shed should be equipped to manage change effectively by helping them to:

- develop transferable or new skills demanded in the economy;

- find new jobs through the use of active labour market policies; and

- cope with the new financial realities they face through direct financial aid in the forms of benefits or adjustment insurance/compensation.

Similarly, it is also important that the transition to a low carbon economy does not exclude certain groups from participating in the opportunities or gains associated with this growth. Newly created green jobs will not only require high level skills. Whilst it is true that higher-level skills will be needed for some jobs this will not be the case for *all* jobs. For instance, a recent study in London estimated that around half of the existing low carbon jobs in London would require either intermediate or low level skills[47] (see learning model). Enabling people to participate is crucial in this regard and more effort is needed to help young people and those currently out of work to benefit from the opportunities associated with the green economy. Moreover, facilitating access to employment opportunities for the low skilled and vulnerable in society also plays an important part (i.e. ensuring public transport routes are well designed and enable the unemployed or inactive to reach areas of high levels of job growth within a reasonable time).

Greening the Sydney economy

To understand the potential of the transition to a low carbon economy it is important to dispel the biggest myth of all – the "green economy" is not a new economy. In fact, the transition should be seen as part of a wider economic restructuring of the economy over the medium to long-term, similar in nature and pattern (if not considerably smaller in its potential) to the shift to a knowledge economy that has been on-going in developed economies for decades.

The growth in the knowledge economy was characterised by firms investing more in knowledge or intangible assets (over physical assets) in order to grow.[48] Over time the prominence of knowledge and services has grown and become more integrated within the wider economy. In the same way that knowledge was the defining difference between the growth that emerged in the latter part of the 20th Century, "Green" or growth that is derived from low carbon or environmentally sustainable business practices, products goods and services will be the defining difference in the economy in the first half of the 21st Century.

In order to maximise the benefits from Green Growth sooner it is essential that this new growth model be fully integrated into the conventional economic framework. In the OECD's Green Growth Synthesis report it is argued that:

> "Green growth policies will require an integrated strategy that effectively combines economic, environmental and social policy objectives covering demand and supply aspects, both economy-wide and at sector level to insure coherence in policy design and implementation as well as to maximise the synergies among different policy actions. Green growth will also necessitate the development of new measurements covering dimensions of quality-of-life above and beyond material well-being."*[49]*

It is possible to argue that the transition to a low carbon economy will follow a similar pattern to that seen by the knowledge economy, generating significant opportunities and value that have the potential to grow in prominence over time if the transition is managed both effectively and efficiently. Nevertheless, getting a sense of the current potential in Sydney is difficult. And in this regard, Sydney should take a lesson from an interesting quote by Smith, which was written at a time when policy makers were struggling with how to quantify the real added value of the knowledge economy:

> "The weakness or even complete absence, of definition, is actually pervasive in the literature… this is one of the many imprecisions that make the notion of "knowledge economy" so rhetorical rather than analytically useful" [50]

Here Smith makes the critical point that without a definition it is essentially impossible to determine the exact value of the knowledge economy then, in the future or over time. If you apply this same logic to

the measurement of the green economy then you would find it difficult to effectively measure its size, value or potential to grow. It is this lack of a city wide consensual definition that makes it difficult to value or predict with any robustness the potential size of the green prize.

To date no single study has been able to accurately quantify the size of the potential opportunity at the city, or indeed national level in Australia. Much of the literature estimates effects and impact, but often in isolated sectors, which are often found as sub-sectors in other broader studies on the 'Green Economy'. A recent study attempts to bring some of this research together at the national level, but merely to show the current potential (see Box 4).

Box 13. Snap shot of Australia's Green Potential

- AUD 16-20 billion. The size of the Australian environmental protection industries in 2004/05

- AUD 9 billion and 13 000 jobs. In 2009 420 clean-tech companies had a combined revenue of AUD 9.2 billion and employed over 13 000 people

- AUD 12bn and AUD 20bn. Domestic eco-tourists who took part in nature activities spent AUD 12bn in 2008. Two-thirds of international visitors to Australia took part in nature activities and spent AUD 20bn

- AUD 8bn and 33 000 jobs. The revenue and employment figures of the Australian waste disposal industry in 2009

- AUD 5bn and 32 000 jobs. The revenue and employment figures for the environmental science services industry in 2009

- AUD 11bn and 26 000 jobs. What the Australian recycling sector contributed to the economy and employment in 2006

Source: Adapted from Ben Eltham, 2010, 'Australia's Green Economic Potential', Centre for Policy Studies

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Defining green jobs?

The debate on green jobs, or the "greening" of existing jobs, is an essential element of the policy discussion and a pre-requisite in order to quantify potential labour market opportunities. Defining what constitutes a "green job" definitively has proven difficult. A wide range of definitions have been proposed that range from being very narrow and specific, such as the Eurostat definition of eco-industries (i.e. industries producing environmental goods and services) to more broader industry classifications that also encompass industries that are dependent on environmental resources and environmental quality, such as those developed by the United Nations and the ILO. This disparity in definitions also produces a disparity in job numbers. For instance, using the aforementioned definitions suggests that green jobs make up either 2% of the total EU workforce or 20%.[51] This reiterates the difficulties associated with measuring the job potential of a shift to greener growth.

In a recent paper exploring the labour market implications of climate change, the OECD defined green jobs as "jobs that contribute to protecting the environment and reducing the harmful effects human activity has on it (mitigation), or to helping to better cope with current climate change conditions (adaptation)"[52]. This definition was intentionally broad and strategic so that it could be used as a starting point for more locally adapted definitions in line with the wider aims of local green economic and employment development policies. Moreover, any definition derived today will almost certainly need to be adapted over the coming years as green technologies evolve and understanding of green jobs and green growth increases.

However, being able to define the number of green jobs is helpful insofar as providing a means of initial measurement and in order to develop more accurate and effective locally relevant policy responses. In light of this a number of countries, cities and regions have developed definitions of green jobs that are aligned to national or local economic, social and environmental characteristics.[53]

Box 14. Industry analysis of the Low Carbon Environmental Goods and Service Sector in the UK

Three main sectors are included in the broader definition of environmental goods and services termed the Low Carbon and Environmental Goods and Services (LCEGS) sector:

- Environmental: products and activities perceived generally as being relatively mature and which formed the core of previous definitions used by the UK Government.

- Renewable Energy: activities previously treated as part of the Environmental sector (such as micro generation), or Energy sector (such as larger scale power and heat generating systems).

- Emerging Low Carbon: activities such as alternative fuels, building technologies, nuclear power (NB not applicable to Australia) and carbon finance.

These three Level 1 sectors are further split into 23 'Level 2' sectors including:

Environmental	Renewable Energy
• Air Pollution Control	• Hydro
• Environmental Consultancy	• Wave and Tidal
• Environmental Monitoring	• Biomass
• Marine Pollution Control	• Wind
• Noise and Vibration	• Geothermal
• Contaminated Land Remediation	• Solar PV
• Waste Management	• Renewable Consulting
• Water Supply and Wastewater Treatment	
• Recovery and Recycling	**Emerging Low Carbon**
	• Alternative Fuels
	• Alternative Fuels for Vehicles
	• Additional Energy Sources
	• Carbon Capture and Storage
	• Carbon Finance
	• Energy Management
	• Building Technologies

The study draws from over 720 sources. It includes activities undertaken by companies across the whole environmental supply chain, from R&D, through manufacturing into distribution, retail, installation and maintenance services. Companies are included in the supply chain where 20% of their turnover is supplied into the LCEGS sector, but importantly only the sales activity relating to this sector is included in this study. This inclusion is akin to the way other sectors of the economy, such as aerospace, are measured. The study uses 'bottom-up' data based on what companies actually do, rather than what they are classified as doing under the SIC system. In doing so, it identifies and measures 2490 Environmental, Renewable Energy and Emerging Low Carbon activities within 23 sub-sectors.

Source: BIS/Innovas, (2009), 'Low Carbon Environmental Goods and Services: an industry analysis.

Box 5 presents the example of the UK Department for Business Innovation and Skills, which made the case for creating an experimental "bottom-up" and "top-down" definition of low-carbon activity that could capture the new and emerging sub-sectors that were often not covered in the UK's Standard

Industrial Classification (SIC), by assessing business activity and Gross Value Added as well as differentiating between core and supply chain activity. Not only has this enabled the UK to estimate the size of the sector and its growth potential, it has also been adopted across a range of regions and cities, such as London, as the measure of the low carbon sector. Importantly, any definition should take into account the difficulty of trying to make the new and emerging industries fit within the existing SIC codes and classifications.

More relevant in a Sydney context is the recent work by Ehmcke *et al* in conjunction with the Department for Climate Change in New South Wales. The authors combine industry and occupational classifications alongside a definition of green that distinguishes between "environmental" and "sustainable", which they argue are different but can coexist to create a conceptual framework to define Green Jobs.[54] Figure 10 shows this representation.

Figure 10.   Green collar worker conceptual framework
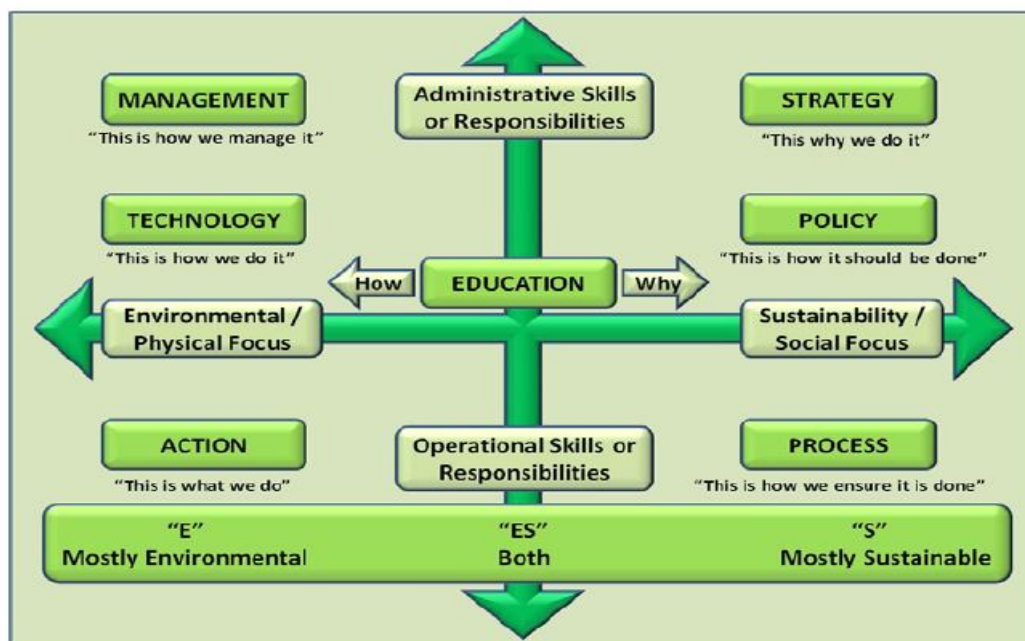
Source: Ehmcke et al, (2009), Who are green collar workers? Defining and identifying workers in sustainability and the environment

This framework identifies seven broad types of green collar worker: those involved in management, strategy, technology, policy, education, action and process. Using this conceptual framework and applying it to the Australian Bureau of Statistics and Statistics New Zealand standardised coding for jobs and skills (ANZSCO - ANZ Standard Codes for Occupations) and for industry sectors (ANZSIC – ANZ Standard Industry Codes) it is possible to create a taxonomy of green jobs that could be used to quantify the number of green jobs in the economy using existing data sets as shown in Figure 11.

Figure 11.   Taxonomy of green jobs in Australia

Environmental / Sustainable

E	Mostly environmental
ES	Both environmental and sustainable
S	Mostly sustainable

Occupation

1	Managers
2	Professionals
3	Technicians and trades workers
4	Community and personal service workers
5	Clerical and administrative workers
6	Sales workers
7	Machinery operators and drivers
8	Labourers

Skills Levels

1	Degree
2	Diploma
3	Certificate III with experience or Certificate IV
4	Certificate II or III
5	Certificate I or Semi-skilled

Industry

A	Agriculture, Forestry and Fishing
B	Mining
C	Manufacturing
D	Electricity, Gas, Water and Waste Services
E	Construction
F	Wholesale Trade
G	Retail Trade
H	Accommodation and Food Services
I	Transport, Postal and Warehousing
J	Information Media and Telecommunications
K	Financial and Insurance Services
L	Rental, Hiring and Real Estate Services
M	Professional, Scientific and Technical Services
N	Administrative and Support Services
O	Public Administration and Safety
P	Education and Training
Q	Health Care and Social Assistance
R	Arts and Recreation Services
S	Other Services

Source: Ehmcke et al (2009)

Greener jobs and the labour market potential

The *Great Recession* resulted in job losses, often concentrated amongst the most vulnerable workers in our societies. In the two years to the first quarter of 2010, employment fell by 2.1 % in the OECD and the unemployment rate increased to 8.5 %.[55] The extent of these losses has led to a concerted effort by Governments across the globe to help people find work. Many commentators have predicted an era of Green Jobs and green job expansion that can help replace those jobs that have been lost. The stimulus funding that followed the crisis was an attempt to invest in green initiatives and at the same time to create new "green jobs". For instance, in the Republic of Korea the Government invested KRW 50 Trillion into the "Green New Deal" and estimated that by 2012 this would create 960 000 jobs. In France one-fifth of the total stimulus investment, designated for green measures, was estimated to create around 100 000 jobs during 2009-2010.[56]

Unfortunately the notion that new green jobs would be a silver bullet for the job crisis was perhaps too simplistic and underestimates the complex nature of modern labour markets, the likely impact of climate change and the transition from a high carbon intensive economy to a low carbon economy. Whilst there is an expectation that new green jobs will be created as "brown" jobs go, this is often overstated. It is more likely that existing jobs evolve into "greener jobs" and existing skills sets become greener.

Recent research suggests that the skills demanded by firms in a greener economy will continue to be relatively generic, including literacy, numeracy, team working, communication and problem solving. In certain circumstances occupations may require more specific "green" skills sets but these are likely to be either top-up skills that enhance existing competencies but applied to new green technologies or ways of working, or more specific skills linked to emerging sub-sectors or fields.[57] Table 7 provides an example of categorisation of green occupations in a selection of countries. This table was prepared by the OECD, with entries from findings reported in a CEDEFOP[58] and ILO[59] study, along with a number of other studies.

Table 7. Skills profile of green/greening occupations: illustrative examples (OECD countries)

Sector	Occupations	Growth prospects	Skill profile
Recycling and waste management	Waste sorting and reception	Long-established	Low qualification (minimal on-the-job training)
	Recycling and waste technician/waste recycling operator	Vocational qualification	Low – medium qualifications depending on country
	Hazardous waste management	Growing demand in medium term due to tighter regulations	Medium and high level
	Sustainable design manager, recycling and reclamation engineer, co-ordinator of recycling activities, regulatory programme compliance officer	Rising longer term demand from other sectors	Medium to high level skills to address organisational sustainability issues and embedding sustainability principles into product design and production techniques
Transportation (increase energy efficiency and/or reduce the environmental impact of various modes of transportation)	Specialised technicians of fuel cell batteries, automotive engineering technicians	Introduction of renewable and cleaner fuel for transportation	Low to medium for installation and maintenance
	Railroad conductors, locomotive engineers, truck and bus drivers	Greening existing occupations	Topping up existing skills
	Automotive engineers, freight forwarders, fuel cell engineers, logistics analysts/engineers/managers, supply chain managers, transportation engineers and planners	Reorganisation and re-engineering of existing (and new) transportation systems	Medium and high level skills combined with sector specific pre-existing medium-high competencies
Vehicle manufacturing (energy efficiency, waste and product lifecycle management, shift of business model from products to services)	Engineering technicians, welders, transportation equipment painters, metal fabricators, computer controlled machine operators, engine assemblers and production helpers	Greening production techniques for vehicle components	Low pre-employment skills with (up to) medium re/up skilling levels
	Computer software engineers, electrical engineers, and operations managers	Changes in production methods and business models	Medium and high skilled
	Applied researchers, fundamental researchers	Development of future technologies	high
Mining and extractive industries (shrinking the environmental footprint)	Operators of heat coproduction, geospatial information technologies	Upgrading core technologies	medium
	Geospatial information scientists, managers for heat coproduction, energy auditors, technology developers and managers	Supply chain reorganisation and upgrading management practices	High level, particularly related to the development phase of renewable energy, new technologies.
ICT	Smart grid and building specialists, database administrators	"smart" ICT applications and changes in business model for billing and customer relations	Medium to high

Source: OECD (2011) Labour Markets in the Transition to Green Growth: Challenges and Policy Responses. Background document for the OECD Green Growth Strategy. Internal Document. February.

Importantly, the employment effects of the transition are likely to vary in the short, medium and long term. Recent research summarising these employment effects suggests that: **in the short term** there is likely to be a direct employment effect as jobs are lost in carbon-intensive sectors, which will grow less fast (or even contract), and new jobs are created in the new low carbon sectors. As these technologies are

still relatively new they are likely to be more labour intensive in the short-term, which is likely to result in a positive net employment effect. Over **the medium term,** and as the low carbon sectors penetrate deeper into the economy, this trend is likely to be reinforced driven by behavioural change and consumer habits. However, it is **the long-term effects** that are the most interesting. The authors argue that the dynamic innovation effect is likely to generate the largest job expansions, as firms invest in research to exploit new low carbon opportunities that generate further investment and job growth that potentially could trigger a fundamental overhaul of the economic system.[60] Whilst this latter point is perhaps optimistic and relies heavily on economies adapting and equipping their future workforce with the skills and capacity to achieve this, it does offer some credibility to the view that a "green utopia" is within long-term reach of developed economies.

Numerous studies have attempted to quantify the growth potential of the low carbon sector. Many of these findings suggest strong growth prospects, often above forecast trend growth rates, which support much of the consensus on the scale of the opportunity. However, converting these numbers into potential employment opportunities is more difficult. Whilst the majority of these studies generally find positive job trends, caution should be applied when using these figures, as the methodologies from which job numbers are derived are of variable quality,[61] and the definition of what qualifies as a green job is not fixed as discussed above. Despite this, the prospects surrounding green growth suggest that the employment potential of the transition to a low carbon economy remains strong.

Greening of Sydney's economy

Forecasting future green and greening opportunities at a Sydney level is difficult given the lack of reliable data. There is a general view that potential opportunities do exist but quantification remains difficult. Recent work by international bodies such as the United Nations, OECD, ILO and CEDEFOP has tried to assess both the current and future opportunities in relation to green growth, although much of this work is still in its infancy. Research by the United Nations Environment Programme groups green jobs into six distinct sectors in order to assess their progress and potential: Energy; industry; transportation; buildings; agriculture; and forestry.[62] Similarly, further research by the Australian Council of Trade Unions in 2008 suggests that the country is well placed in a number of areas including renewable energy, energy efficiency, biomaterials, green buildings, waste and recycling and sustainable water systems.[63]

Applying this intelligence to the existing profile of Sydney's economy suggests that Sydney is particularly well placed in a number of areas to benefit from the transition to greener growth. These include, but are not limited to:

- **renewable energy** as demonstrated by the development of the City of Sydney's Tri-generation master plan;

- **manufacturing** by greening methods of production and supply chain activity, which despite falling share of GRP could still add value and help firms move up the value chain;

- **transportation** by potentially enhancing the coverage of the public transportation network and shifting consumer commuting and purchasing behaviour to embrace greener transportation principles;

- **sustainable water systems** by further advancing and applying water use efficiency and treatment as seen in the work of local TAFEs, for instance;

- **green buildings** by constructing more eco-friendly new builds (commercial and residential) and retrofitting the existing stock of "brown" buildings where strong reductions in emissions can be made;

- **energy efficiency** by reducing the carbon footprint of commercial and residential premises through advances in energy efficient technologies in buildings, industrial processes and appliances; and

- **waste and recycling** by continuing to support the need to recycle waste and, where possible, ensuring the policy and regulatory environment enables this particular sector to continue to grow.

The economic potential of greening the economy is vast and still relatively undervalued. Global markets for low carbon and environmental goods and services are growing. In London the growth of the low carbon sector has remained significantly above the trend growth rate for London's economy despite the global financial crisis. Similarly, venture capital investment in green industry increased its overall market share between 2003 and 2008 from 1.6 % to 11 % and a net worth of $US3 billion by 2007.[64] This suggests that a more buoyant financial services sector in Sydney could be well placed to develop **green financial products and services,** such as carbon trading and carbon finance, under a supportive policy and regulatory environment.

Given Sydney's existing economic profile, the economy seems relatively well protected from some of the potential adverse impacts of greener growth relative to the rest of Australia. Whilst the on-going decline of the manufacturing sector is problematic, this is being driven much more by deindustrialisation and global economic change than the shift to greener growth. Moreover, deindustrialisation could also represent an opportunity for Sydney's manufacturing sector to green production and create environmentally friendly supply chains, which might enable firms to extract additional premiums from consumers who are prepared to pay extra for greener products.

The analysis in this section suggests that many of the opportunities for green jobs are likely to come from up-skilling and re-skilling rather than new green jobs. Moreover, the gains are to be found across sectors in the economy and align to the view that greener growth is more likely to be derived from greening sectors in the existing economy.

Analysis of Sydney

Opportunities to seize

Global city with huge economic capacity

Sydney is a leading global city and knowledge economy and Australia's gateway to the global economy. Despite the recent recession, Sydney has fared well and potentially gained ground on other leading world cities. Its financial institutions should also be better placed to lend to businesses and help fuel the economic recovery. Importantly, its key industries remain buoyant and the city is well placed for the 21st Century.

The sustainability agenda engrained into the Sydney psyche

The Greening of Sydney's economy is being successfully driven by the sustainability agenda. This is a key strength and Sydney appears to be world leading in this regard. To a large extent this focus on environmental sustainability is a by-product of the Sydney/Australian climate where individuals are more

aware of environmental concerns. This level of awareness should be utilised and suggests that people in Sydney are already willing to modify their consumer behaviour in relation to the environment, which is one of the crucial elements in the transition to a greener economy. At an industry level, this level of awareness has filtered into business operations where companies are also embracing the sustainability agenda, particularly in regard to energy efficiency of commercial buildings and supporting employees to think and act sustainably when at work.

World class Vocational Education and Training (VET) system and industry connectivity on sustainability

The VET system in Australia is globally recognised as being world-class. In particular, the TAFEs in Sydney exhibited a combination of modern and innovative teaching facilities and techniques relating to education and training in the sustainability agenda. Much of the evident recent investment in green skills was derived from the Australian Government's investment in green capital infrastructure. In addition, industry appeared to be engaged with developments in the VET sector, although the formal route for business to engage through Industry Skills Councils (ISCs) appeared less strong on the front-line. However, this is explained by the ISC's federal remit where ISCs have played a strong and active role in developing learning modules that are used by the VET sector. Additionally, more local employer engagement was also evident, with local practitioners having contacts with local businesses or having recently joined teaching from industry. This has enabled the VET sector to develop a wide range of industry relevant training – often top-up courses – to equip the existing and future greener workforce in Sydney as needs change.

Low level of general unemployment and a strong skills base

The low level of unemployment, particularly in comparison to international cities, is encouraging and suggests that Sydney is matching the labour demand and supply in the economy. Similarly, strong performance against the national average unemployment rate is an encouraging trend amongst urban labour markets where cities tend to perform less well. The growth in higher-level skills amongst younger Sydney-siders bodes well for the future and should help Sydney to continue the transition to a high value added goods and services economy. This is particularly important to the green economy where the ratio of high skilled jobs to low skilled jobs is significantly greater.

Emerging consensus on the need for a city wide strategy for sustainability

Recent developments, including the establishment of RDA Sydney, represent an opportunity to further develop citywide analysis to provide an evidence base to inform the future direction and shape of the Sydney economy. The development of a shared evidence base and understanding of the city's problems will help future planning and enable Sydney to better showcase its strengths and weaknesses to State and Federal policy makers. This is particularly relevant to the sustainability agenda where key stakeholders were beginning to come together across the city. Building on these relationships and partnerships should be a priority, in order act as a catalyst for a citywide sustainability strategy, which could potentially be seen as a working template for future city wide strategic partnerships and work.

Carbon trading

Sydney weathered the global financial crisis and its markets are potentially well placed to benefit from the growth in carbon trading that is one of the fastest growing sub-sectors in the financial sector. The potential benefits are huge and could enable the diversification of Sydney's financial sector into new products.

Equipping out-of-work Sydney-siders to benefit from future job opportunities

The low female participation rate and high levels of youth unemployment are problematic but do potentially represent spare capacity in Sydney's labour market. Helping those people not currently in work to undertake training to equip them with the skills necessary to compete for future job opportunities should be part of the City's attempts to share the proceeds of green growth more evenly and potentially meet skills shortages in areas where they exist.

Challenges ahead

Lack of citywide direction, leadership or strategic vision

The Governance system in Sydney is particularly complex with 41 LGAs and a lack of central co-ordination that stakeholders suggested was dampening the medium-term growth potential of the economy. Leadership and strategic direction at the city level is urgently needed to ensure Sydney is able to remain competitive in the global economy and to enable it to embark on longer term citywide planning. Whilst it is unclear what the likely impact is on the sustainability agenda for the city, a lack of co-ownership and city-wide leadership is likely to limit the wider impact of any citywide initiatives.

Mixed labour market picture

Female participation rates are low and have shown little sign of improvement in recent years (although this was partially as a result of previous labour market and social policy initiatives). Not only does this have potentially negative effects on gender pay gaps and levels of social inclusion, but also Sydney is not fully utilising the skills currently available in its workforce. Moreover, this mixed labour market picture suggests that the low levels of unemployment are masking higher levels of inactivity. Youth unemployment is also high, although this is very much a global trend amongst advanced economies. Extended levels of unemployment at an early age can have catastrophic effects on society in terms of crime, poverty and reduced social mobility and also for individuals who face significant and persistent wage scars.

Lack of common definitions regarding green jobs and the green economy

The lack of a consensual city-wide definition of green jobs or the green economy, and lack of any robust quantitative data at a city level, makes planning and measuring the impact of the transition to a green economy very difficult. To date, Sydney is unable to quantify the size of the potential opportunity and it risks reducing the speed at which the labour market and skills system can respond to the needs of a rapidly changing green economy.

Complex governance system hampers citywide developments

The complex nature of the city governance structures and lack of co-ordinated economic development strategy may hamper economic developments that are of strategic importance to the city. Moreover, efforts to drive the sustainability agenda falter as lack of agreement and leadership results in a myriad of different views and approaches.

Recommendations for Sydney

Need to develop a common definition of green jobs

This chapter has been unable to accurately define the potential associated with the transition to a greener economy because of a lack of robust quantitative data or evidence at the citywide level. As Sydney

partners do not have an agreed local definition of green or greener jobs, it is difficult to estimate the labour market impact of the transition to greener growth.

The OECD does not advocate a specific definition and there are a range of different definitions being used globally, such as the UNEP and ILO definitions or countries, cities and regions developing their definitions to fit with local circumstances. This chapter has outlined two definitions. The first, the UK and London examples, set out an experimental approach that maps business activity across three areas (environmental, renewable and emerging low carbon) to estimate the GVA of the low carbon economy in the UK and London (see learning models). The second approach, developed in conjunction with New South Wales, presents a conceptual framework and then a taxonomy of green jobs that can be applied to standard industrial and occupational classifications used in Sydney. Given that the latter model has already been tailored to the Australian labour market, it would make sense **to explore the feasibility of developing this further as a definition to be used by partners in Sydney for measurement purposes.** Importantly, a consensual definition agreed by all Sydney partners represents the best starting point for measuring green jobs.

Need to assess the impact of greener growth on the Sydney labour market

Once a definition is reached it could then be possible to undertake another study to identify the number of green jobs in Sydney and the extent to which new jobs, the "greening" of existing jobs or other effects are taking place. This assessment should be taken in close consultation with industry representatives of all the sectors in order to guarantee an accurate exercise. Not only would such a study be useful for understanding the wider impact of greener growth on the labour market, it could also help partners to tailor their products and services to help meet the future labour demand, the need to up or re-skill the workforce and potentially highlight any adjustment policies that may be required. It is worthwhile mentioning that the ILO has recently published a report which presents various methods to identify skills needs on the labour market in transition to the low carbon economy[65].

Enabling the disadvantaged and unemployed to benefit from "greener" jobs

Sydney has a low unemployment rate and high levels of male participation. However, this positive performance masks **high levels of youth unemployment, low female participation rates and spatial inequalities in labour market outcomes** that suggest that many Sydney-siders are not benefitting from recent growth and are also at risk of missing out on future growth.

Sydney is already very advanced in developing solutions to reduce carbon emissions through a wide range of different initiatives throughout the city region. However, the city **may be missing out on a potential "double dividend"** by not aligning this public procurement better with back-to-work programmes to get the unemployed and inactive into work. A number of OECD countries, have begun to insert clauses into public procurement contracts including fencing a proportion of jobs for local unemployed people. These types of clauses could be applied to initiatives in Sydney to help local unemployed people to benefit from sustainability initiatives in terms of job and skills training opportunities.

The various levels of Government could come together and work with Job Network providers and TAFE colleges **to develop a city-wide greener job and skills programme** that looks to help these groups gain the skills to enable them to make the most of future job opportunities in a greener economy. Similar programmes have been developed before, such as the Green Corps programme (which ended in 2009), but often they have focussed on a small part of the green economy and have never been developed in conjunction with a city-wide carbon emissions reduction programme in order to create a double dividend.

Develop a Sustainability Forum for Sydney

Many of the most successful initiatives to drive forward sustainability at a city level have been led by groups of stakeholders (public, private and NGOs) who come together to share experiences, knowledge, best practice and the pool funding in order to achieve or deliver mutual beneficial objectives. A good example of a successful approach is the Two Cities initiative (see learning model in Annex), which has successfully developed Saint Paul and Minneapolis into a leading clean tech region in the US.

The creation of a **Sustainability Forum** to act as a working group or board representing the key stakeholders in Sydney in relation to the green economy should be brought together to provide leadership and strategic direction to a pan-Sydney sustainability agenda. Its first piece of work could be to develop the recommendations 1 a) and b) in this chapter as a starting point and over the medium term a pan-Sydney collectively owned sustainability strategy. Importantly, the Sustainability Forum should bring together a wide range of key stakeholders including representatives of Local and State Government, employers, training providers, TAFE, HE and the trade unions.

CHAPTER 3.

SKILLS DEVELOPMENT IN THE GREEN ECONOMY

By Paul Dalziel

Abstract

This chapter analyses strengths, weaknesses, opportunities and threats arising from the way in which public and private agencies in Sydney identify skills needs and deliver skills training to prevent skills gaps from hindering business opportunities in the developing green economy. It uses a skill ecosystem framework for the analysis. The chapter finishes with four recommendations arising from the analysis and suggests a case study from outside Australia as a practical example supporting each recommendation.

Policy issues

In Australia and internationally there is considerable concern that skills gaps in the labour force will create problems for private businesses and national governments responding to business opportunities and policy issues arising from 'the green economy'[66]. The following concluding paragraph of a summary statement from the House of Commons Environmental Audit Committee (2009, p. 3) expresses this concern well:

> Relying exclusively on the market to address skills gaps is causing delays in greening the economy. The demand-led approach to skills has not worked because employers are unable effectively to articulate their needs to the skills delivery bodies. The Government's new skills strategy must prioritise the skills needed to drive the economy through the low-carbon transition. A body to lead the green skills agenda must be found and low-carbon skills need to be integrated through the whole skills delivery system to encourage behavioural change across the entire economy.

The response in the United Kingdom was to launch, at the end of March 2010, a consultation on "meeting the low carbon skills challenge" identified in the base document as comprising five key elements for employers, the skills system and Government (Low Carbon Skills Team, 2010, p. 4):[67]

- delivering significantly higher volumes of generic STEM skills [skills in Science, Technology, Engineering and Mathematics] at all levels;

- developing and delivering rapidly the specialist skills solutions that will be needed for emerging sectors and technologies;

- getting more young people and adults interested in low carbon careers, skills and qualifications;

- stimulating employer demand for and investment in low carbon skills; and

- replicating good practice rapidly in each of the above, within and between emerging sectors.

The same challenge has been recognised in Australia, with a strong focus on these and other elements such as workforce development, retraining and strengthening the capabilities of the country's vocational

education and training systems to deliver skills for sustainability that are relevant to the needs of industry. In 2009, for example, the Australian and state and territory governments entered into a Green Skills Agreement based on a shared understanding that "decisive action is needed to support Australia's transition to a sustainable, low-carbon economy" (COAG, 2009, p. 2). That agreement offered a broad definition of 'skills for sustainability' or 'green skills' (idem):

> Skills for sustainability, also known as green skills, are the technical skills, knowledge, values and attitudes needed in the workforce to develop and support sustainable social, economic and environmental outcomes in business, industry and the community.

A recent study of six European countries (Denmark, Germany, Estonia, Spain, France and the United Kingdom) has highlighted the role that regions are playing in addressing challenges of this nature (CEDEFOP/ILO, 2010, pp. 11-12):

> One clear finding is that efforts to identify skill needs for jobs in a low-carbon economy have been taken most prominently by the regions, in cooperation with other partners – industry and educational bodies, such as universities and vocational institutions. In four of the Member States examined, Denmark, Spain, France and the UK, regions are playing a primary role in identifying skills needs for jobs in a low-carbon economy. Regional actors are well placed to identify local strengths and weaknesses and can bring together key players such as industry, research institutes and educational facilities to provide appropriate responses.

This experience is also apparent in Australia. The State of New South Wales has been a leader in this field (see BVET, 2009). In 2005, the NSW Board of Vocational Education and Training (BVET) commissioned research on the skills required for sustainable business development, which informed the release of the first edition of *Skills for Sustainability* in 2007. This was followed, in March 2008, by the *NSW Green Skills Strategy*, implemented by the NSW Department of Education and Training. Later that year, the Board provided funding to identify, develop and assess training service models for skills development relevant to the financial services, logistics and creative industries sectors. The second edition of *Skills for Sustainability* was published in 2009. This identified four fronts where skills are central in driving and enabling environmental sustainability (BVET, 2009, pp. 12-13).

> Leadership – industry and enterprise leadership is required to develop innovative business culture and practice under new commercial and legislative imperatives, using new management skills to ensure that responses to environmental drivers are examples of best practice and will bring competitive advantage to business.

> Innovation – new ways of thinking about business models, production and processes and the delivery of excellence in new products and services.

> Processes – more efficient production, supply chain management, marketing and delivery of goods and services.

> Technical application – the provision of new technology by management requires a workforce with knowledge and skills ready to embrace new processes, install and maintain new technology.

Against that background of innovation and leadership, this chapter analyses strengths, weaknesses, opportunities and threats arising from the way in which agencies in Sydney identify skills needs and deliver skills training to prevent skills gaps from hindering business opportunities in the developing green economy.

Framework to analyse Sydney's Skill Ecosystem

The New South Wales Department of Education and Training has developed a useful framework for analysing regional systems of skill needs identification and skills training, based on the concept of a "skill ecosystem"[68]. The advantages of using the skill ecosystem approach have been well described by Skills Australia (2010, p. 53):

> The term 'ecosystem' captures the notion of an intersecting and mutually reinforcing equilibrium between skills supplied by the training system and skills demanded and applied in workplaces. While this equilibrium can be understood at the enterprise level, an industry approach goes beyond finding solutions to specific problems to promote broader industry capability to plan and manage skill development. This approach offers the potential to engage, influence and share learning among large numbers of enterprises. It also positions industry to develop a critical mass of workforce development activity that is mutually reinforcing and sustainable.

Figure 12 presents two perspectives within a skill ecosystem. It begins in Figure 12(a) with the perspective of employers, who are motivated by market opportunities. When market opportunities are matched with appropriate capital investment and the employment of productive workers, this creates profits that are necessary for the enterprise to be sustainable and to generate funds for on-going investment in new technologies and skills. Figure 12(b) presents the perspective of employees. To develop marketable skills an employee needs to invest in education and training in a way that matches his or her personal abilities and employment opportunities.

Figure 12.   Perspectives in a skill ecosystem

(a) Employers   (b) Employees
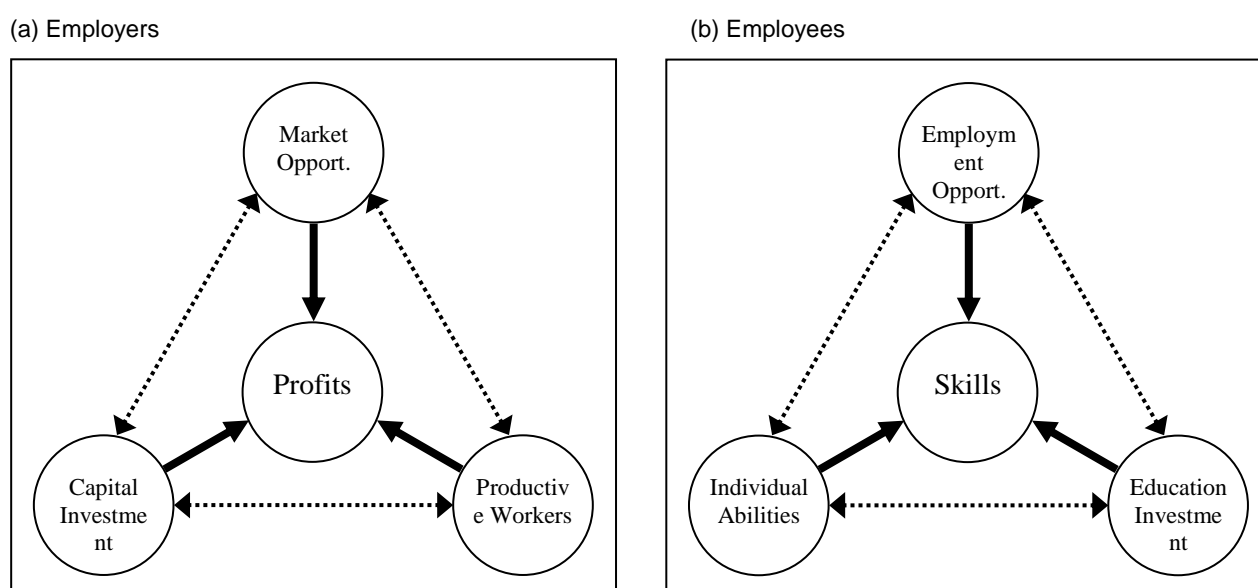
Source: Dalziel (2010a and 2010b)

Figure 13 brings the two components together into a single diagram. It recognises that it is the employer's profits that give rise to employment opportunities and that it is the employee's skills that define productive workers. Thus profits and skills reinforce each other at the core of Figure 13. The figure also recognises that a skill ecosystem must be led by market opportunities and must be founded on the individual abilities of the labour force, all within a wider policy environment. These features are well recognised in the international literature on skills development in the green economy. The House of

Commons Environmental Audit Committee (2009, p. 10), for example, emphasised the importance of the Government providing "business and industry with enough detail about the changes that need to be made in a way that would enable them to secure sufficient investment against clearly achievable business plans". CEDEFOP/ILO (2010, p. 14) argues that in Europe "core skills – including STEM skills – need to be improved at secondary and tertiary levels, as they provide the basis for high-level low-carbon skills".

Figure 13.   Skills and profits in a skill ecosystem
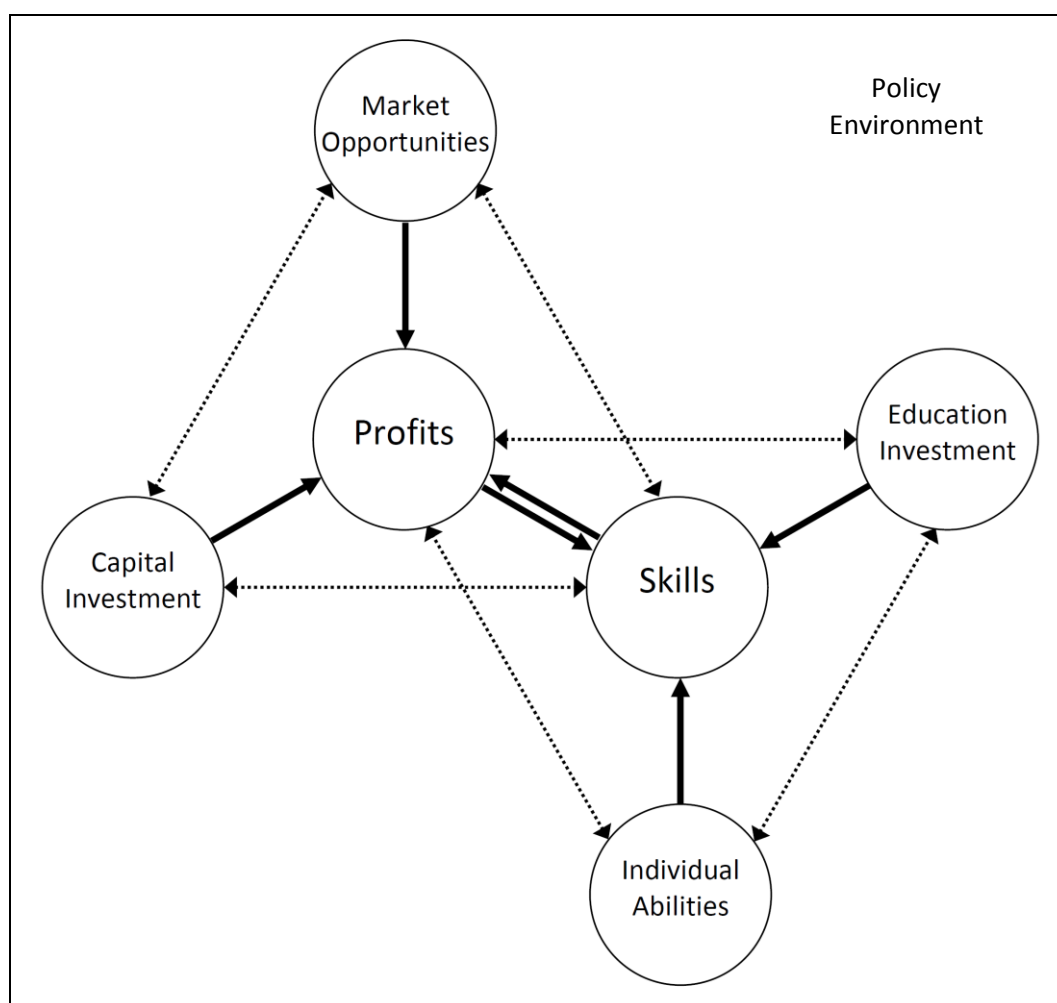
Source: Dalziel (2010a and 2010b).

Finally, Figure 13 illustrates the coordination problem, in which employers are making capital investment decisions separately from the education investment decisions of current and potential employees. This separation means that employers can be constrained (at least in the short-run) by skill gaps in the labour force, while potential workers can waste time and financial resources by investing in education that is out-of-date or produces skills for which there is no employer demand. One of the major purposes of the policy environment within which the skill ecosystem sits is to address this coordination problem.

The VET Sector in Sydney

TAFE NSW provides a comprehensive range of vocational education and training (VET) in Sydney with more than 500 000 enrolments annually.[69] It operates through ten Institutes, four of which are based in the Sydney metropolitan area[70]: Northern Sydney Institute (50 424); South Western Sydney Institute (73 069); Sydney Institute (73 359) and Western Sydney Institute (47 407). All four metropolitan institutes are involved in providing skills training for sustainability and each offers leadership in different areas of this training. An example from each institute can illustrate this leadership in skills training for the green economy.

- The **Sydney Institute** has established a Sustainable Hydraulic Trade Centre at its Randwick College campus, funded by an AUD 6.4 million grant from the Federal Government's Education Investment Fund (EIF). The Centre allows training in best practice green building skills to be delivered with a focus on hydraulic trades, including waste water treatment and reuse, evacuated tube water heating and rain water harvesting.

- On 1 November 2010, the Green Skills Hub facility was opened at the Nirimba Precinct of the **Western Sydney Institute**. This facility is a Living Laboratory designed to model sustainable practices and provide innovative training in the subject areas of green electrical engineering, plumbing, refrigeration and information technology. It was funded under the Federal Government's Training Infrastructure Investment for Tomorrow initiative.

- In August 2009, the **Northern Sydney Institute** obtained a Federal Government grant to expand an onsite water management scheme at its Ryde College. Specialised training activities ensured that ecologically sustainable developments, such as water sensitive landscaping design, were incorporated into the project. The Irrigation Training Facility was completed in July 2010, providing a water reticulation system to facilitate a simulated working environment for students.

- The refurbished **South Western Sydney Institute's** Macarthur Building Industry Skills Centre (MBISC) opened for students in July 2010 as a result of an AUD 9.9 million grant from the Federal Government's Education Investment Fund. It is a centre of excellence in building industry trade training, using an integrated project-based approach to skills development. The MBISC delivers green skills training with a focus on eco-friendly building techniques and sustainability.

These four examples are not randomly chosen; in each case the example has involved a substantial capital investment incorporating the latest "green technologies". In terms of Figure 13, this brings together the capital investment and the education investment components of a skill ecosystem, with a number of important benefits:

- educators in the institute are able to engage with the green technologies during the construction phase, upgrading their own knowledge and skills in the process;

- students in the relevant programmes are able to learn skills for sustainability in hands-on courses using state-of-the-art technologies;

- the institute is able to design a curriculum of skills that is directly connected to the new technologies the students will be using in the workplace;

- the institute is able to demonstrate to employers in the industry the potential benefits (financial and marketing) of adopting green technologies; and

- the institute is able to enter into partnerships with industry leaders who are in the vanguard of supplying, developing or adopting the latest green technologies.

These initiatives are embedded in a wider institutional commitment to sustainability within the TAFE Institutes. The Northern Sydney Institute, for example, has adopted an environmental policy committing it "to establishing, promoting and maintaining a culture of environmental responsibility, both within the Institute and in the wider community" (NSI, 2009). This Institute has been accredited with ISO 14001 for Environmental Management Systems, observing on its website that it is the only TAFE institute to achieve and maintain this international standard. The Sydney Institute publishes a "Sustainability Report Card" on its website (Sydney Institute, 2010), which includes highlights such as the establishment of green skills forums and projects to work with industry, annual reductions in its environmental footprint and the creation of new training facilities for workers in the green economy. The Western Sydney Institute has published an environmental sustainability commitment statement that sets out twelve commitments to practise and demonstrate environmental sustainability in all aspects of its business (WSI, 2009).

The institutes have taken steps to identify sustainability skills demanded by industry. The Sydney Institute, for example, has a public webpage dedicated to profiling its "green skills and sustainability skills"[71]. This offers 59 sustainability skills courses and another 129 courses that include sustainability skills modules. The sustainability skills courses are offered in five areas: building and construction; electronics and communications; information and communication technology; property services; and transport and logistics. Similarly, the Northern Sydney Institute has published a three volume set of reports on "Education and Training for Sustainability" detailing an overview of the institute's capabilities and achievements, what it offers in the form of industry focussed and enterprise specific courses, and snapshots of achievements by its staff and students. Box 6 offers a case study of how the Northern Sydney Institute partnered with a major national retail chain in Australia to design a sustainability skills training programme for the retailer's staff.

Box 15. Industry partnership for sustainability skills training

Bunnings Warehouse, a large hardware chain in Australia requested TAFE NSW Northern Sydney Institute to provide sustainability training for its retail staff, with a focus on water; power and lighting; waste management, recycling and composting. This would enable their staff to give advice to customers on sustainable solutions to their household and business building and gardening projects. The training programme was called "Sustainable Solutions".

Prior to delivery, NSI training team members worked closely with Bunnings Warehouse staff in the development of the programme to ensure their environmental policy and sustainability approach was consistent in the training materials and the range and nature of the products sold by Bunnings Warehouse related to the course materials and delivery methods.

During 2010, in partnership with Bunnings Warehouse, NSI with the NSW TAFE Centre for Learning and Innovation (CLI) produced an online 'Making Sustainable Choices' training programme modelled on the face-to-face pilot programme. This is now being rolled out to 32,000 Bunnings Hardware staff across Australia and is a significant contribution to the development of green skills for the retail hardware sector. Bunnings Hardware staff provided a list, for the online programme, of the top 10 questions asked by customers in regard to sustainability/sustainability product options. The answers to these questions were included in the product content to ensure that all Bunnings team members were equipped to answer them when asked.

The programme consists of four primary topic areas: Sustainability, Water, Waste and Recycling and commences with a knowledge quiz to test the participants' current knowledge about sustainability in general and questions relating to the topic areas contained within the programme. Once participants have completed the quiz, they are guided through the four topic areas. Audio is provided over each of the slides in the presentation. The option to read the transcript is also provided for those with a visual learning style.

This training case study highlights the need for training providers to work closely with industry partners to establish their sustainability training needs, to make the programme relevant and contextualised for their organisation and to trial and pilot the programme for feedback and improvement.

The Garnaut Climate Change Review made the following comment about the importance of education and training in the face of climate change (Garnaut, 2008, p. 586):

> The structural changes that will emerge in a low-carbon emissions, growing economy will change requirements for human capital. In Australia, a history of skills development has been inherent in a globally successful resources sector. Australia should be structurally well placed to apply such skills to new activities.

The examples discussed above suggest that the best of the TAFE programmes in Sydney do indeed reflect Australia's traditional strength in skills training and clearly represent international best practice, although there are always questions about whether such initiatives are demand-driven (especially by industry) or supply-driven (responding to specific funding opportunities from federal programmes). Under federal legislation, all Australian based companies with energy consumption of more than 0.5 PJ per annum are required to report on energy use and energy savings under the Energy Efficiency Opportunities Program. Hence these companies have established systems and training to improve energy efficiency, resulting in a reduction in carbon emissions, but many large firms rely on in-house and specialist training organisations rather than using TAFE programmes. Smaller companies are not subject to the same requirements, so there may be a role for partnership networks made up of regional development agencies, local government agencies and TAFE Institutes to address this universal issue.

Analysis of Sydney

This section explores the ideas of the previous section further by providing an analysis of the strengths, weaknesses, opportunities and threats faced by Sydney agencies in identifying and addressing skills needs for sustainability.

Strengths

Supportive framework at the federal level

The Australian Government recognises the importance of training for the workforce that includes skills for sustainability. It has entered into a formal agreement with state and territory governments "to build the capacity of the vocational education and training (VET) sector to deliver the skills for sustainability required in the workplace and to enable individuals, businesses and communities to adjust to and prosper in a sustainable, low-carbon economy"[72]. The federal framework for assuring quality and relevant training in skills for sustainability is well established[73]. Industry Skills Councils, whose role is to identify and respond to the skilling needs of their industries, have proposed three guiding principles for workforce training in environmental sustainability: it should be industry specific; it should be appropriately timed; and it should add value[74]. Within that framework of principles, the Industry Skills Councils have made the following observations[75]:

> Nearly all ISCs have designated a staff member to oversee environmental sustainability activity and extensive work is in process for the development of new units and qualifications. All Training Package reviews currently underway or planned now incorporate an analysis of environmental sustainability considerations for skill and knowledge development. Extensive stakeholder consultation mechanisms are in place across the board to ensure that ISCs have the latest industry intelligence to inform a strategic response. The ISCs are confident that effective measures to address environmental sustainability in the workplace are well in hand when it comes to Training Packages.

Supportive frameworks at the state and local levels

The Government of New South Wales has adopted a vision for the state's economy that it will be technologically advanced, highly innovative and creative, leading in low carbon approaches and globally competitive (Government of New South Wales, 2010, p. 3). The City of Sydney has been working since 2008 to implement a Sustainable Sydney 2030 strategy based on a vision of a green, global and connected city by 2030 (City of Sydney, 2010). These high-level strategies have been supported by initiatives to strengthen skills training for sustainability, including major reports from the Green Skills NSW Taskforce (2009) and the Board of Vocational Education and Training (BVET, 2009). Subsequently the NSW Department of Education and Training showcased 2010 as "the Year of Learning for Sustainability". It offered awards for outstanding achievements under this theme, at the same time as it was already working with training providers to increase their capabilities under the TAFE NSW Education for Sustainability Action Plan 2007-2010. State Training Services (part of the NSW Department of Education and Training) now provide funding for: energy efficiency and other green skills courses; professional development for trainers and assessors, and registered training organisations; and in some cases, the development of training resources or training support activities.

The Innovation Council in New South Wales has commissioned a study into specific business opportunities in a low carbon economy. The project is intended to identify and define growth opportunities across eight industry areas: grid solutions, green buildings, waste conversion, low emissions vehicles, solar, wind, geothermal energy and business services.

Advanced higher education, TAFE and private training institutions

Sydney has five universities based in the city: Macquarie University; University of New South Wales; University of Sydney; University of Technology Sydney; and University of Western Sydney. These universities offer a wide range of research and education programmes relevant to skills for sustainability. The previous section of this chapter has described some of the recent developments and achievements in the four metropolitan TAFE Institutes of Sydney. This has included significant federal government investment in state-of-the-art training facilities, such as the Sustainable Hydraulic Trade Centre at Randwick College, the Green Skills Hub facility at Nirimba, the Irrigation Training Facility at Ryde College, and the Macarthur Building Industry Skills Centre. Evidence gathered during the study visit shows the critical role that is being played by 'green skills champions' among the managers and staff of the four metropolitan TAFE Institutes, driving forward developments in learning for sustainability. As well as these public institutions, private registered training organisations have emerged to offer generic and tailored courses in skills for sustainability.

Taken together, the large number of these institutions provides a strong infrastructure in Sydney for training in skills for sustainability. It means the city has sufficient critical mass that could be leveraged to create a national and international profile for its expertise in this form of training. To build on this critical mass, the physical infrastructure must be matched with teaching capabilities that are relevant to the genuine market opportunities of the city's industries and enterprises.

Weaknesses

Low local flexibility and fragmented demand

Because Australia has a strong federal framework for setting training standards, this can have the unintended consequence of stifling local flexibility to meet emerging training needs demanded by a local cluster of employers. In particular, State training programmes can fund only competencies recognised in the National Skills Framework. There is a reasonably straightforward process for registering an emerging

skill competency for development into a certified standard, but this takes time and can be a barrier to innovation by a TAFE Institute wanting to meet (or perhaps encourage) industry demand. The recent "Emerging Technologies Project Report" included many comments along the lines of "Industry continues to be critical of the lack of flexibility in the training system, which was identified as an impediment to emerging technology skills development[76]".

The significance of low flexibility is reinforced by what is termed "fragmented demand" by industry for training in particular skills. It is rare for an industry sector to demand a new skill across the board; it is more common for a small number of firms to begin trialling an emerging technology and discovering in the process what new skills are required for its staff. Flexibility is important if training providers are to be able to respond to fragmented demands of this type. More generally, flexible delivery, cost effectiveness and a partnership approach to designing programmes that strengthen enterprise competitiveness will be important in stimulating demand for training by businesses.

Weak professional development of Institute staff

The "Emerging Technologies Project Report" further commented that "the VET sector must ensure that in implementation, trainers and the equipment and other resources they use are up to speed with emerging technologies"[77]. There are resources available for training the trainers in sustainability (for example, the programmes offered by the National Centre for Sustainability at the Swinburne University of Technology and the "Green Skills for Vocational Education and Training" workshops offered by the NSW Department of Education and Training). Nevertheless it can be difficult to obtain resources for releasing staff for professional development. Consequently, while some educators in the TAFE NSW system are acting as champions in promoting training in sustainability skills, it can be difficult to engage other staff members. One Institute, for example, found that about 12 % of its staff completed an on-line training facility that had been made available for everyone to help develop sustainability competencies. This may indicate a low level of interest among some staff or it may suggest that other methods of delivering professional development in this area are required. Without effective up-skilling of the trainers, students in some programmes may not be introduced to the latest sustainability skills technologies and practices due to gaps in the knowledge of their educators.

Low take-up by SMEs

It is well recognised internationally that small and medium-sized enterprises (SMEs) find it difficult to access training opportunities for their staff. They are less likely to have a dedicated human resource manager and it is harder to release staff for off-site training. They are also more likely to want custom-designed and specific skills training rather than generic and broad training. There are policies that are attempting to address this issue for sustainability skills training. Enterprise Connect, for example, is a Government programme that provides support to eligible Australian small and medium-sized businesses. A key element of the programme is the Clean Technology Innovation Centre, which offers a range of business and advisory services[78] for SMEs in the clean energy sector. At the State level, Sustainability Advantage is a business support service from the Department of Environment and Climate Change NSW. It is designed to help organisations understand sustainability, successfully manage for a better environment and add business value[79]. Industry Investment NSW offers "LEAN and green" business master classes for people who want to learn how they can improve business efficiency through the application of "lean" business practices, coupled with environmental sustainability, to reduce costs, increase profits, open new markets and create jobs[80]. Despite initiatives like these, it is not always easy for SMEs to take up training opportunities in skills for sustainability. This makes it difficult to upgrade the skills of the existing workforce in sectors dominated by SMEs.

Opportunities

Strengthening connections between VET providers and industry

There are considerable benefits to be gained from strengthening connections between vocational education and training (VET) providers and industry. These connections can be informal (for example, consultations at a breakfast hosted by a TAFE Institute or an economic development agency) or formal (for example, to make progress on a project in which the partners have identified genuine business opportunities). Rather than arranging general partnerships, it can be more engaging to establish innovation networks around specific issues, since it is easier for partners in such networks to identify and capture benefits for themselves from their participation. In order to keep the focus on meeting genuine market opportunities, it can be beneficial if a network is industry-led rather than led by a training provider.

Connections of this type have been made in Sydney. The creation of the Green Skills Hub at the Nirimba campus of the Western Sydney Institute, for example, involved a close partnership with Schneider Electric that continues with the facility being made available to Schneider Electric for the training and education of customers, business partners and staff in the use of its EcoStruxure solution. The Northern Sydney Institute has formed partnerships with Local Councils – Rockdale, Fairfield, Lane Cove, Hunters Hill – based on the initial programme customised for 1 000 Warringah Council staff in the National Unit of Competence. They participate in environmentally sustainable work practices. The Sydney Institute has created a Sydney Green Skills Alliance to develop partnerships that will help forge a new collaborative approach to meet the challenges of Australia's new green economy. Partnerships such as these should not focus exclusively on the institutional level; individual trainers also benefit from close contact with industry and experts in emerging technologies. It is a mechanism, for example, to keep trainers up to speed with the skill demands of employers in their locality.

Scaling up innovation successes to higher levels

This report has described many examples of innovative successes within individual TAFE NSW Institutes that improve sustainability skills training to meet industry needs. To take full advantage of such successes, there need to be mechanisms for scaling them up to the state level. At a minimum, this includes a carefully designed communications strategy for identifying successes and bringing them to the attention of influential stakeholders. This has been assisted in recent years by organising awards to recognise innovative or best practice initiatives. A further step is to ensure that the State's research community (including academics in university departments) has appropriate institutional incentives to engage in applied research, such as identifying strengths in the VET sector. Similarly, there can be opportunities to leverage strengths developed at the regional level into leadership at a national or international level. This opportunity is explored further in the recommendations section.

Improving careers information, advice and guidance

Much of the discussion in this chapter has focused on improving the capabilities of training providers and of industry. Nevertheless, there are important issues around how information is provided to people who are making choices about their own individual training. These choices represent substantial investments of time and money in gaining human capital; consequently there are potentially large benefits to be gained from ensuring decision-makers have access to good information about industry demand for skills, including skills for the green economy. In the modern era of life-long learning and career management in the face of technological advances and industry restructuring, all citizens should have access to high quality careers information, advice and guidance. Nevertheless, it is particularly important that young people are not shut out of opportunities in the green economy as a result of receiving guidance from counsellors who have not kept up to date with developments in local and national labour markets.

Threats

"Lock in" to the wrong skills training and industrial development trajectory

In a regional skill ecosystem, industries are continuously investing in emerging technologies, training providers are continuously investing in specialist facilities, and workers and new entrants are continuously investing in skills training. In all cases, there are risks involved, since the decision-maker may discover in the future that an unpredictable change in market conditions or the policy environment has resulted in the original investment becoming obsolete. In the past, some government policies at the federal and state levels (such as industrial policy based on 'picking winners' for public subsidies) have been rightly criticised for locking individuals or businesses into a narrow skills training or industry development trajectory that has proved unsustainable.

Uncertainties around government environmental policies

It is difficult for businesses to identify genuine business opportunities with confidence when there is uncertainty about government environmental policies. In some cases this has led to high business resistance to anything with 'a green label', regarded at best as a distraction from more pressing commercial issues (such as improving basic skills in literacy and numeracy or raising enrolments in science, technology, engineering and mathematics courses). In these cases, there is little interest in learning about 'green skills' qualifications or employing people with these qualifications. This in turn can feed through into low demand for the qualifications from trainees.

Skills gaps can create disasters

This chapter began by noting the universal concern that skills gaps can constrain business opportunities. In some cases, a skills gap can create a disaster. A recent example was the Government's Home Insulation Program, which was suspended on 19 February 2010 after reports that there have been four deaths of young Australians and over 100 house fires linked to the installation of insulation[81]. This was an apparent example where a potentially valuable government programme failed, with disastrous consequences, at least in part because workers did not have the right skills training.

Recommendations for Sydney

The SWOT analysis in this chapter shows that Sydney has considerable strengths in skills training for sustainability. These strengths have been further developed by recent federal and state investments in the Australian National Skills Framework and in individual TAFE Institutes to upgrade the country's VET system's ability to deliver skills for the green economy. It is also clear that the weaknesses identified in this chapter have been well recognised in Australian policy research reports, with evidence that policy makers are addressing these areas of weakness as resources permit. Consequently, this section will concentrate on four recommendations that aim to develop opportunities and reduce threats for enterprises that are leading the development of the green economy in Sydney.

Assess training needs based on analyses of authentic market opportunities

Figure 13 recognised that a skill ecosystem must be led by market opportunities. At detailed level, it is individual enterprises that identify and respond to such opportunities, but this can be assisted by the provision of authoritative information by independent third parties. This consideration is true not only for businesses but also for school leavers and current employees making decisions about whether to invest in skills training for sustainability. The current situation is also affected by a high degree of uncertainty around key policy parameters such as the price of carbon emissions and the details of programmes aimed at reducing global climate change.

Against this background, some countries and some regions have found it valuable to commission authoritative training needs assessments based on analyses of authentic market opportunities. Examples include the country-level research in Ireland (Forfás, 2010) and the California Workforce Education and Training Needs Assessment (discussed in more detail as a learning model in the Annex). To be authoritative, the study must be carried out by a team of people who are recognised as expert and independent; this is typically achieved by engaging university researchers with a national or international reputation in labour market analysis. The identification of authentic market opportunities is often informed by official strategies for reducing greenhouse gas emissions and achieving other social, economic and environmental goals.

Sydney is well placed for such research. The City of Sydney, for example, is committed to reducing greenhouse gas emissions by 70 % over twenty years, supported by well-formulated strategies to reach that goal. Sydney contains world-class research universities and has a very highly developed system of VET provision. It would be valuable if the release of policies of this nature was followed shortly afterwards with an authoritative training needs assessment arising from each policy. Over time, this would build up expertise in preparing such assessments and would foster confidence in local businesses and the local labour force to invest in relevant technologies and training that will help the green economy to grow.

Strengthen the ability of local businesses and local training providers to develop innovative solutions for filling gaps in skills for sustainability

This chapter has identified examples of how local businesses and local training providers are developing innovative solutions for filling gaps in skills for sustainability. These include the Sydney Green Skills Alliance at the Sydney Institute, the partnership between the Western Sydney Institute and Schneider Electric, and the partnership described in Box 6 between Bunnings Warehouse and the Northern Sydney Institute. Examples such as these illustrate the way in which a high-skills ecosystem can coordinate technological investment by enterprises with training investment by workers to enhance a regional or a sector's economic development.

Current policy developments in the United Kingdom suggest that the ability of local businesses and local training providers to develop innovative solutions for filling gaps in skills for sustainability could be strengthened. The United Kingdom government is setting up local enterprise partnerships in England with mandates, among other things, to engage directly with networks of colleges and training organisations in order to advance local strategic priorities. This is a very recent policy announcement, so details are still emerging as this report is being written (see further details in the learning model presented in the Annex).

RDA Sydney shares many of the characteristics and roles envisaged for the English local enterprise partnerships. It also has experience in working with industry leaders and local TAFE Institutes to develop skills training for important clusters in Western Sydney. This recommendation would substantially increase its work in this field for the whole of Sydney. RDA Sydney would also be a suitable organisation for ensuring that training programmes are available that cater to the specific requirements of small to medium-sized enterprises. This recommendation would be assisted by greater flexibility for TAFE institutes to create new courses in response to clearly identified market opportunities for local industry (in advance of a new competency being formally recognised in the National Skills Framework).

Seek to leverage the work already underway under the Sustainable Sydney 2030 vision to achieve international leadership in a particular technology or groups of technologies

The *Sustainable Sydney 2030* vision is for a green, global and connected city. The strategy describes Sydney and Australia's most significant global city and international gateway. It aims for Sydney to be recognised as an environmental leader with outstanding environmental performance and new 'green'

industries driving economic growth. The City of Sydney has initiated a process that will see 70 % of its energy needs produced locally from trigeneration plants.

Consistent with this vision, it may be possible to leverage the work already underway for Sydney firms to achieve international leadership in a particular technology or groups of technologies. Achieving such an ambition could potentially generate national and global business opportunities based on the on-going development of world-class skills in the technology. A learning model presented in the appendix describes how a facility in Denmark is aiming to be Europe's number one centre for testing, demonstrations and research into technology harvesting renewable energy offshore (the Lindoe Offshore Renewables Centre).

The Lindoe Offshore Renewables Centre initiative is made possible by close collaboration among large enterprises, local government and university researchers. Following the Lindoe example, leadership for any similar initiative would need to come from the business community with the support of local and State governments.

Maintain a systematic approach to preparing young people for participation in the green economy

The NSW Department of Education & Training recognises the significance of sustainability education. Sustainable Schools NSW, for example, is a government-funded support programme to help schools integrate environmental learning and awareness into all aspects of their activities, supported by a wide range of web-based resources at www.sustainableschools.nsw.edu.au. This support reflects the principle that the education system should aim to ensure that school leavers are well equipped for emerging opportunities in the green economy.

Consistent with this principle, all school leavers should have fundamental capabilities in literacy, numeracy and computing skills, since school leavers without these capabilities will find themselves locked out of many training and employment opportunities. Similarly, this chapter has quoted the view of the CEDEFOP/ILO (2010) and others, that foundational skills for science, technology, engineering and mathematics (STEM) provide the basis for high-level low-carbon skills. It is important that young people are aware that 'skills for sustainability' are not an alternative to these core skills but build on them to make the discovery and dissemination of new technologies possible.

Indeed, a key message in a wide range of reports on the green economy is that technological advances are occurring at a fast pace. Consequently, the professional development of counsellors and educators involved in career guidance and career education must ensure they are able to communicate to their clients about careers opportunities emerging in the green economy. This obviously includes careers counsellors in schools, but will also include subject teachers in schools and in tertiary institutions. The Education Employment Linkages learning model in the Annex suggests that members of the Careers Advisers Association of NSW are natural allies for disseminating knowledge to young people about emerging opportunities and requirements for participation in the green economy.

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CHAPTER 4.

ENABLING GREEN GROWTH IN SYDNEY

By Cecilia V. Estolano

Introduction

The transition to the green economy presents significant potential for job-generation and sustainable economic development for the Sydney Metropolitan area. Sydney's exceptional training and workforce development system gives it strong potential to adapt to transformations in the labour market caused by climate change policies. Notwithstanding the bold leadership set forth in plans such as the Sydney Metropolitan Strategy, the Sydney metropolitan Plan 2036 and Sustainable Sydney 2030, a major barrier to green growth in the region has been the failure to coordinate infrastructure investment with economic development, land use and sustainability planning at the Regional/Metropolitan level. It remains to be seen whether the New South Wales government's Metropolitan Plan for Sydney 2036, released in December 2010, will effectively support more sustainable development patterns and a stronger infrastructure for green business development. A critical mass of Sydney's 41 local government authorities (LGAs) could use the Regional Plan for Sydney, developed by Regional Development Australia-Sydney, as a starting point to integrate their own land use, economic development, infrastructure planning and sustainability policies at a regional level. LGAs working together should view their sustainability plans and policies as potential drivers of business growth and job creation in emerging and transforming sectors. Coordination among LGAs, in collaboration with other government, business and community partners, presents the best opportunity for meaningful engagement of diverse stakeholders that can lead to improved "green" governance – i.e. deep and broad public engagement in the transition to a clean energy and green economy.

Sydney can also build on its strengths as Australia's primary global city financial centre, its concentration of universities and TAFE institutes and its critical mass of manufacturing industries by establishing a consortium focused on fostering and supporting innovation in key green clusters for which it enjoys a competitive advantage. Such a consortium should consist of industry leaders, venture capitalists, innovators at the universities and TAFE institutes, and key local and state government leaders dedicated to promoting new cleantech business formation, support and expansion. Finally, Sydney's LGAs should seek to leverage their buying power by coordinating procurement policies to support local small and medium sized enterprises (SMEs) that provide green products and services.

Policy Issues

Green Growth and Sustainable Economic Development

Major metropolitan areas like Sydney have the scale to advance green growth if they leverage and integrate their governance, innovation and economic resources. Green growth is "the pursuit of economic growth and development, while preventing costly environmental degradation, climate change, biodiversity loss, and unsustainable natural resource use."[82] It aims to promote economic growth and development on more environmentally and socially sustainable grounds. Achieving green growth requires policy intervention at the national level and stronger international cooperation. The OECD is framing a Green

Growth Strategy (Figure 14) that makes the case for a green growth model and outlines what it will take to implement.

Figure 14.   How can we get to a greener economy?

The need for a green growth model	• Assess the challenges of business as usual • Frame the pro-growth potential of green growth • Highlight the complementarities between economic and environmental policies • Analyse the need for new measurements of well-being
Promoting the transition – going beyond the status quo	• Remove barriers to green growth: e.g. environmentally and economically harmful subsidies, regulatory failures, structure of tax systems, barriers to trade in environmental goods and services, restrictions to green FDI flows • Facilitate transformational change: e.g. pricing externalities and valuing natural assets; accelerating green innovation; smart regulations; promoting behavioural change; innovative financing mechanisms; sound corporate practices; green ODA
Enabling change – the political economy of structural adjustment	• Assess the expected sectoral re-allocation • Analyse the role of labour market and skills development policies in mitigating adjustment costs • Ensure regional/spatial policy coherence • Promote multi-level governance • Manage distributional effects • Defuse competitiveness concerns and avoid green protectionism
Measuring progress	• Develop a framework and principles for green growth measurements • Conduct a stock-taking of existing measures and gaps • Build a small set of key headline indicators, supported by a model set of indicators • Describe how indicators can be used
Delivering on green growth	• Sketch recommended policy pathways • Consider lessons learned from existing low-carbon development strategies and economic reviews • Define the elements of a pro-poor green growth approach for developing countries

Greener growth

Source: OECD, The Green Growth Strategy: How can we get to a greener economy? November 2010

Within this framework, major metropolitan areas are the places where policies aimed at sustainability, economic development and social equity can most directly be connected and integrated. Cities consume over two-thirds of the world's energy and produce 70 % of its greenhouse gas (GHG) emissions.   Cities are key players in addressing climate change and environmental degradation. They are where most people live and where most high-value economic activity occurs. They are also the places where issues of poverty, income inequality and economic opportunity have the most resonance and where social equity advocates have the greatest influence over public policy.

Cities and metropolitan areas have been acting in the climate and sustainability arena even in the absence of comprehensive and sustained national policies such as cap-and-trade and carbon pricing.   For example, the C40 Cities Climate Leadership Group, the Cities Programme of the Clinton Climate Initiative and ICLEI-Local Governments for Sustainability, provide forums for cities implementing meaningful sustainability and local climate-related policies to share best practices, receive technical assistance and benefit from preferential pricing for best-in-class energy efficiency building technologies.[83]   The City of Sydney has been a member of both the C40 and ICLEI and has been viewed as a leader among cities in the sustainability movement.

Key Elements of a Sustainable Economic Development Strategy

A metropolitan area like Sydney can go the next level and link environmental goals to broader social equity goals in a sustainable economic development strategy. True integration and coordination of sustainability and economic development strategies is challenging and requires a comprehensive approach in order to maximise the potential for creating good-paying jobs in the green economy, particularly for disadvantaged and marginalised communities. An effective sustainable economic development strategy at the metropolitan level should include seven critical elements:

(1) Articulate a clear vision for a lower carbon economy that generates good-paying jobs

An effective strategy starts with a vision that can inspire behavioural and policy changes. Elected officials and civic leaders must make the case that a green growth model is necessary to address critical environmental issues and that it can lead to business and job growth in the metropolitan area. As the analysis below describes, the City of Sydney's *Sustainable Sydney 2030* offers a bold vision of sustainability.

(2) Focus on green clusters, particularly in the manufacturing sector, for which a region has a competitive advantage

Industry clusters are geographic concentrations of firms interconnected by the markets they serve, the products they produce, their suppliers, their workforce needs and supporting organisations. A well-designed cluster strategy for the green economy targets a particular green sector (such as renewable energy, green buildings, transportation, waste and recycling) based on a realistic assessment of a city's competitive advantages[84]. It builds on existing assets and collaborative dynamics. It draws on data and analysis to identify clusters, inform initiatives and track performance. It targets resources to address gaps in cluster performance and uses data to better inform, link, leverage and align existing programmes to stimulate innovation, new-firm start-ups, and job creation.[85]

Special emphasis should be given to growing manufacturing clusters in the green economy for three key reasons. First, as illustrated by the wind, solar and transportation industries, the overwhelming majority of jobs in many green subsectors tend to be in manufacturing, not design, installation and operation.[86] Second, manufacturing jobs typically pay higher median wages than median wages overall.[87] Finally, manufacturing is a major driver of economic innovation and wealth generation. For example, in the United States, the manufacturing sector accounts for 70% of all private research and development spending and 90% of all U.S. patents.[88] A careful analysis of its existing business base, supply chains and network relationships may reveal the specific green clusters for which Sydney has a competitive advantage and for which a cluster strategy would be appropriate.

(3) Invest in strategic infrastructure that will enable green growth

Infrastructure in investments that help to build a low-carbon economy, such as renewable energy production, smart grids, energy efficiency upgrades of existing buildings, expansion of public transport systems, and the upgrading of water and sewer systems, can be significant drivers for green growth.[89] Major metropolitan areas with publicly owned utilities, like Sydney, are particularly well positioned to leverage their scale and financing capacity to make investments that will be the building blocks of a green regional economy.

(4) Integrate demand-driven workforce development strategies with economic development policies through meaningful partnerships with business, unions and intermediaries

Cluster or sector strategies for economic development must be coordinated with sector workforce development strategies to be effective in supporting green growth. Sector workforce strategies have emerged as one of the most effective methods of training, placing, retaining, and creating career ladders for workers in middle skill jobs and for meeting the needs of employers for skilled workers. Sector workforce strategies involve "regional partnerships of employers, educators, workforce developers and other stakeholders that address the skills needs of critical industries in a region."[90] Carefully designed customised training and sector initiatives that focus on the needs of businesses in a specific industry, such as labour shortages in specific occupations, can also help workers address issues of skill development and career mobility.[91] As discussed below, Australia's TAFE system and Sydney's TAFE Institutes represent a model of this type of sector approach.

A key element of success in the U.S. experience of these sector workforce programmes is the designation of a workforce intermediary that functions as a coordinating body. The intermediary brings together the partners necessary to address both employer and worker needs. This may include pre-apprenticeship and union apprenticeship programmes, and additional wrap-around services necessary to help job seekers succeed. The close relationships developed in these programmes provide opportunities to directly engage employers to improve working conditions, access, career ladders and wages in the target occupation.[92] This helps to drive the goal of achieving high-road green industries.

(5) Foster creativity and innovation through collaborations among universities and research institutions, venture capital and other investors, industry innovators and key government officials to support the development of new and emerging green sectors

Metropolitan areas can accelerate the innovation and diffusion of green technologies by creating a green growth innovation platform for start-up companies, economic development organisations, business groups and venture capitalists. The key is to leverage existing assets such as research institutions, centres of excellence, universities and training institutes through partnerships and collaborative projects around specific new or emerging green business lines. Sydney could build an innovation platform along the lines of Cleantech San Diego[93] and the Colorado Cleantech Cluster[94] in the green growth sectors for which it has a competitive advantage.

(6) Leverage the different roles of government (regulatory, proprietary, landowner, facilitator/convenor and investor) to drive investment towards the creation of good quality jobs in the green economy with career ladders also to the middle class

Local governments can influence the size and character of the green economy at this early stage in its development depending on the nature and scale of government activity and to what extent the distinct roles that government plays have been aligned to support green growth.

a. Regulator

The most obvious role that government can play in driving environmental, economic and social equity outcomes is as a regulator. Exercising its regulatory authority over land use, a local government can encourage, for example, compact, energy and water efficient new development around transit-oriented districts that includes a certain percentage of affordable housing.

b. Proprietary Capacity or Market Participant

In its proprietary capacity as a market participant, a local government can support local green business growth by giving preferences to locally owned and operated suppliers of green goods and services that it purchases. It can inject a social equity component into its procurement policy by including living wage

provisions in its contracting agreements to impose wage and benefit requirements on businesses that contract with a local government.[95]

In the case of Los Angeles' ground-breaking Clean Truck Programme, it can ban the use of dirty diesel trucks at the port and require that short-haul drayage of containers off-loaded from ships be performed only by companies (and not independent owner-operator truckers) that can meet the requirements of a standard port concession agreement. This concession agreement mandates the use of low emission trucks and makes the company responsible for complying with license, insurance, maintenance and safety requirements. The concession agreement also requires companies to use a First Source Hiring Programme that gives preference to local drivers with previous port experience. By requiring that the work be performed by a company, and not an independent contractor, the Port of Los Angeles has effectively given the workers the right to unionise, a right denied to them as independent contractors.[96]

c. Landowner

As a landowner, a local government can exercise more authority over what a lessee builds and operates on land owned by the local government than it can mandate acting out of its regulatory authority. For example, it can mandate that a tenant build to higher green building standards than required by law and restrict the use of the property only to certain types of clean tech or green businesses and even require wage and benefits packages and local hiring goals.[97] As a landowner, a local government can use its property strategically to support broader policy goals such as green growth and green cluster development.

d. Facilitator/Convenor

Local governments, particularly Mayors and other elected officials, can play a powerful but informal role in convening and facilitating stakeholders around critical issues and initiatives that drive green growth. For example, they can bring together university, business and community leaders to form cleantech organisations or green industry support associations. They can facilitate discussions to resolve disputes between labour and business, environmental advocates and industry, and forge compromises that lead to collaborative efforts around common goals.

e. Investor

When a local government subsidises a project it is essentially an investor in that enterprise and can condition its investment on certain returns. It is common practice for economic development, redevelopment, regeneration and revitalisation authorities to impose profit share requirements or interest rates on loans or grants invested in real estate development projects. But a local government can also view its investment as requiring a broader or more socially defined rate of return, such as a percentage of affordable housing included in a project, achieving exceptionally high energy and water efficiency building standards, the creation of well-paying jobs, the hiring of a certain percentage of local unemployed or disadvantaged workers in the construction and permanent operation of the project, and a variety of other benefits delivered to the surrounding community. Community benefits can range from the provision of more affordable housing units than required by law, setting aside open space and parkland, funding homeless services or transitional housing, and funding job training programmes for youth and young adults from the local community.[98] A local government acting out of its authority as an investor can very effectively steer projects towards a green growth pathway.

(7) Meaningfully engage diverse stakeholders in the development and on-going implementation of green growth policies

Local governments are the level of government best suited to engage community members, businesses and other stakeholders in developing green growth policies and maintaining their interest in assisting in the implementation and monitoring of such policies. Local government delivers the basic services that have the most immediate impact on households and firms and they are the most accessible and responsive to constituents. The responsibility to maintain contact with and be responsive to citizens can be an asset to local governments who can articulate a compelling vision for green growth and build a strong and enduring coalition to support green growth policies.

Multi-Level Governance

The seven components discussed above can drive green growth at a metropolitan level if local governments align their policies and combine forces to achieve a scale that can influence the private sector. However, even then success is not assured. Even the most ambitious and enlightened effort at the local or metropolitan level requires some degree of policy coherence with national efforts to remove policy barriers that hamper green growth. Environmentally harmful fossil fuel subsidies, inefficient regulatory interventions and conflicting policy instruments can negatively affect the transition to green growth. Experiences gleaned from green growth stimulus programmes provide some insight into the importance of coherent, multi-level green governance (see Box 7).

Box 16. From Stimulus to Long-Term Policy Coherence

The stimulus packages adopted by governments in response to the global financial crisis and the Great Recession offer a virtual laboratory to evaluate the effectiveness of different approaches to encouraging green growth. These differing strategies range from energy efficiency upgrades of existing buildings, to development of renewable energy sources, public investments in green infrastructure, car-scrapping programmes and basic green R&D. Australia's stimulus was proportionally one of the larger fiscal packages among OECD countries (5.4% of GDP)[99], with 22.7% of it devoted to green stimulus programmes.[100]

Energy efficiency upgrade programmes were a prominent component of most green stimulus packages.[101] Energy efficiency upgrade programmes generally score well on the three criteria (timely, targeted and temporary) that the OECD noted characterise stimulus measures that foster macro-stabilisation in the short-run. They can generate jobs quickly (timely), that many unemployed workers can be quickly trained to fill (targeted) and the fiscal stimulus behind these programmes can be phased once the economic recovery takes hold (temporary).[102] However, whether these programmes can help to transition to a green growth over the long-term depends on their programme design, implementation and prospects for permanent private sector financing.

One significant factor in achieving successful environmental and social equity outcomes with energy efficiency programmes over the long-term is designing a programme that values both the goals of clean energy and improving job opportunities and workforce outcomes for disadvantaged communities through a high-road economic development framework. As a recent report on the California Public Utilities Commission's Long Term Energy Efficiency Strategic Plan notes: "High road economic development consists of a market environment that favours business strategies built on quality of work and innovation, resulting from investments in a workforce that is both highly skilled and rewarded for those skills. Such workforce investments, in turn, encourage the development of a stable and professionalised workforce with the capacity to adapt to new technologies and practices."[103]

In places like Portland, Oregon, and Seattle, Washington, social justice advocates were directly involved in designing city-scale energy efficiency upgrade programmes that are achieving environmental and social equity gains.[104] However, in Australia, the ambitious Home Insulation Program suffered from significant design flaws. Although it helped to insulate over 915,000 homes in 2009, it had to be suspended in early 2010 after four deaths of workers by electrocution, house fires caused by improperly installed insulation and widespread quality and worker training problems.[105]

Permanent private sector financing remains a major barrier to sustaining these programmes over the long-term. Energy efficiency programmes need to be supported by a range of complementary policies to live beyond the stimulus packages. Carbon pricing, removal of fossil fuel subsidies, tighter energy efficiency building

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standards, and home energy use reports can provide a source of continued financing and nudge behavioural changes after the stimulus programmes end.[106]

A major lesson of the energy efficiency stimulus programmes is that a carefully designed programme can achieve social equity and environmental results. However, transitioning such a programme from government subsidies and into a long-term, self-sustaining, market-driven sector requires the alignment of broader energy and pollution taxes and incentives to strengthen policy coherence and send a clear pricing signal. Ultimately, "[a] green stimulus is no replacement for comprehensive climate and energy policy."[107]

Enabling Green Growth in Sydney

Sydney enjoys significant advantages in developing policies and programmes to drive green growth. The Sydney CBD is the nation's major finance and business services hub and the City of Sydney Local Government, which has responsibility for the centre, is actively seeking to be a global leader in sustainability. The New South Wales (NSW) Government has strongly supported green skills training through a partnership between the Department of Education and Training (DET) and the Department of Environment, Climate Change and Water (DECCW)[108]. The NSW Government has enacted the Building Sustainability Index (BASIX) to require all new homes to substantially reduce water consumption and greenhouse gas (GHG) emissions as compared to existing average homes. The four Technical and Further Education (TAFE) Institutes in the metropolitan area[109] of Sydney have developed cutting edge green training curricula and state of the art training facilities.

However, Sydney must also overcome weaknesses in metropolitan governance and a lack of coordinated infrastructure, sustainability and economic planning. Sydney is projected to experience substantial growth over the next 25 years and remains dependent on the automobile as the primary mode of transportation. Seven key universities, campuses of 10 other universities, four major TAFE institutions, and 34 TAFE college campuses are located in the metro area. Yet, Sydney lacks a strategy or organisation dedicated to harnessing the innovation emanating from these educational institutions, disseminating best practice sustainability planning from the City of Sydney to other local government areas, rejuvenating the manufacturing potential of the city and growing opportunities for small and medium-sized enterprises (SME) that develop clean and green technologies.

Sydney stands on the cusp of great opportunity to leverage its vision for a sustainable city into the creation and export of new industries and expertise that will power robust green job growth in the coming decades. By pursuing more integrated strategies at the metropolitan level, Sydney can become a model for driving outstanding environmental performance while simultaneously building on its existing infrastructure, educational and industrial assets to create sustained job growth in new, emerging and transforming fields.

Good practices supporting Green Growth

A strong vision developed with extensive community engagement

One of the most important elements in pursuing a green growth strategy is articulating a vision for the transformative shifts in energy production and consumption, economic development, urban form and other systems required to address climate change. The City of Sydney's *Sustainable Sydney 2030* presents a bold and compelling vision for how this centrally located area will tackle climate change, global competition, transportation congestion, and a half dozen other major challenges over the next 20 years. Sustainable Sydney 2030 is driven by 10 targets that are ambitious, but fulfil the principles of SMART goal setting – they are specific, measurable, attainable, realistic and timely. The targets reinforce each

other and are underpinned by "5 Big Moves" aimed at remaking the City "into one that is green, global and connected."[110]

The centrepiece of Sustainable Sydney 2030 is the goal of establishing a system of "Green Transformers" within the City. The Green Transformers are distributed tri-generation stations, which will initially use natural gas as the primary fuel source, but could also incorporate the use of fuel cells in the future. The Green Transformers will provide electricity, hot water, heating and cooling for new and existing buildings and thus enable the City to shift away from dependence on coal-fired power. The Vision also calls for waste to energy, automated waste collection and water treatment technology to be co-located at the Green Transformers. Altogether, the plan aims to reduce the City of Sydney's GHG emissions to 70% of its current levels by 2030.[111]

Sustainable Sydney 2030 is significant in terms of green growth for three reasons. Firstly, it articulates a bold and comprehensive vision for the leading city in the metro area. Although the City of Sydney's population is only approximately 180 000 and constitutes less than 4% of the metro area total, it is playing a strategically important role at local level. Its efforts to promote coordinated action with other LGAs to implement the Vision can foster important regional policy shifts that can create economic opportunity for metro area residents.[112]

Secondly, the Vision was developed through lengthy and extensive community engagement. Some 12 000 people were consulted directly over 18 months via 30 community forums. Thousands of others attended City Talks or briefings, visited the six week Vision exhibition at the Customs House or engaged via the Vision website.[113] This level of community engagement is important because the policy shifts and resource allocation necessary to implement the Vision require broad, deep and sustained public support. The Vision's plan for a tri-generation and reticulation system will require major resources (up to AUD 950 million) and public works to plan, site and build 15 tri-generation plants and accompanying infrastructure. The city's streets and businesses will be disrupted as the infrastructure is installed, including 40 km of pipes to distribute low temperature hot water to Low Carbon Infrastructure Zones.[114] Building deep and sustained support for such an ambitious plan is challenging but essential. The process used to develop the Vision augurs well for meaningful community engagement in the implementation of the Vision.

Finally, the Vision lays the foundation for potential green job growth and the development of local expertise in emerging sectors in the green economy. The data analysis, modelling, engineering, planning, designing, construction and operations expertise that will be developed by local and regional firms just to implement the Green Transformers concept alone, if appropriately nurtured and marketed, could be the foundation for making Sydney one of the leading centres in tri-generation technology. The City recently released a Decentralised Energy Master Plan, one of five Master Plans that together will comprise the Green Infrastructure Plan that determines the pathway for achieving the City's Vision. Although the Green Transformers concept was the brainchild of UK energy expert Allan Jones, the Decentralised Energy Plan was prepared by a consortium of three Australian companies using metered electricity and gas consumption data that was provided by Energy Australia and Jemena.[115] By building the expertise of local companies, rather than by continuing to import knowledge from abroad, the City is creating the beginnings of a local supply chain of talent and experience.

The scale of the Vision's ambitions, particularly around the concept of Green Transformers, may raise some questions about whether an LGA of less than 200,000 people, even one as economically vibrant as the City of Sydney, should shoulder the risk of implementing a major new approach to infrastructure on its own. For example, how cost-efficient are Green Transformers as compared to demand side management and other alternative approaches? Notwithstanding these questions, the City of Sydney has set forth a vision with *Sustainable Sydney 2030* that has the potential to inspire and align green growth strategies.

A model integrated, demand-driven workforce development system

Sydney's TAFE system presents a model for promoting green job growth in the metro area. From the NSW Government policies down through all four of the TAFE Institutes in the metropolitan area, the workforce training system appears to be an effective mechanism for adapting the labour market to the green economy. Three key factors elevate this system to a best practice.

First, the NSW Government has been a leader in formulating strategies to assist workers and industry in responding to the changes in the labour market that are being caused by climate change and other environmental constraints. In 2007, the NSW Board of Vocational and Educational Training published *Skills for Sustainability,* a ground-breaking report that investigated the skills required for sustainability business development in NSW.[116] This report formed the basis for the *NSW Green Skills Strategy Implementation Plan 2008-2010,* which is aimed at ensuring "that the NSW workforce has the skills and knowledge to support progress in becoming a more sustainable community, with the business and economic benefits that flow from adaptation to environmental change."[117]

The *Green Skills Strategy* focuses on nine priority industries based on their potential to contribute to sustainable industry and commerce and the potential of the vocational education and training (VET) sectors to meet anticipated skill requirements. The Department of Education and Training (DET) has worked to deliver accredited training for sustainability skills to support industry needs through the TAFE Institutes and other Registered Training Organisations (RTOs). DET has directed funding and projects towards up-skilling the existing workforce as well as to providing job-seekers, trainees and apprentices with the sustainability competencies they need to respond to new business demands. It has also placed special emphasis on "training the trainers," thereby ensuring that its RTOs can deliver quality sustainability education.[118]

Second, DET worked closely with DECCW to complement and support the sustainability policies emanating from the NSW Government. For example, the two departments coordinated a Green Skills Task Force that was announced at the NSW Green Skills Summit in 2009. The Green Skills Task Force included education and training representatives, key business and community leaders, environmental groups, sustainability advisers, apprentices and green-skilled workers.[119] Most significantly, DET has coordinated closely with DECCW in implementing the *Green Skills Strategy* and in targeting funds towards high-visibility training needs. For example, DET and DECCW directed AUD 20 million towards green skills development around energy efficiency improvements for buildings. DET and DECCW have also focused on providing support to small and medium-sized businesses to promote more sustainable practices.[120] This type of coordinated "green governance" is essential to maximising the benefits of the transition to a green economy.

Third, the four Sydney TAFE Institutes themselves have embraced sustainability in their operations[121] and training delivery. They have been aggressive in building state-of-the-art facilities to enhance their training packages and have sought out innovative partnerships to craft tailored training programmes for industries with specific, emerging workforce needs. For example, utilising funds from the Federal Government's Training Infrastructure Investment for Tomorrow initiative, the Western Sydney Institute built a Green Skills Hub at Nirimba College designed to model sustainable practices and provide innovative training in green electrical engineering, plumbing, refrigeration and information technology.

Similarly, the Sydney Institute used AUD 6.4 million from the Federal Education Investment Fund, to install "green technology" at an existing building at Randwick College to create the Sustainable Hydraulics Trade Centre. The Centre delivers training to up-skill plumbers and provides best practice green building skills to apprentices with a focus on hydraulic trades, including waste water treatment and reuse, evacuated tube water heating and rain water harvesting.

The Northern Sydney Institute also used a federal grant to expand an on-site water management system at its Ryde College and incorporated drought sensitive landscape design and other environmental sustainable measures into the project as part of its training curriculum. Students can gain hands-on experience with the water retriculation system at Ryde's Irrigation Training Facility. The Grid Connected Photo Voltaic Installation programme, delivered by Northern Sydney Institute, is also a good example of the quick response to an emerging demand (see Box 8).

Box 8. Grid Connected Photo Voltaic Installation Programme

The Grid Connected Photo Voltaic Installation programme was delivered by TAFE NSW Northern Sydney Institute (NSI) as a nimble response to strong and sudden industry demand driven by a NSW government programme offering feed-in tariff rebates to home owners installing solar panels connecting to the grid. This led to a demand for licensed electricians to gain the additional Grid Connected Photo Voltaic Installation qualification in order for home owners to access the rebate.

Recognising that working electricians had limited time available off-the-job to undertake such a programme, NSI developed a blended delivery model unique in NSW, whereby the theory component of the course could be completed through e-learning followed by assessment of the practical component in a workplace simulated environment constructed at NSI's Hornsby College. The success of this approach resulted in over 200 licensed electricians completing the training within the timeframe of the policy driven demand.

An additional benefit of the programme was the donation of solar panels by "Blue Sky" electrical suppliers through a collaborative partnership with NSI, Hornsby College. These panels form part of the EcoSkills Training Structure, a living Laboratory Learning facility, designed and built to sustainability principles by NSI carpentry, electrical and plumbing students and staff.

The South Western Sydney Institute used an AUD 9.9 million federal grant to refurbish the Macarthur Building Industry Skills Centre as a centre of excellence in sustainable building industry trade training. It provides green skills training in sustainable building techniques.

All four Sydney metropolitan TAFE Institutes are increasingly focused on building and expanding on existing partnerships with industry and government in order to deliver tailored sustainability training and succeed in a competitive training environment. For example, the Sustainable Hydraulics Trade Centre relied on in-kind contributions from firms in the water industry to provide state-of-the-art equipment on which students can train. The Northern Sydney Institute has worked closely with the Sydney Water Corporation, the John Holland Group, and the Sydney Metropolitan Catchment Management Authority to develop commercial training services. The South West Sydney Institute has long-standing relationships with Energy Australia and Integral Energy.[122] These close relationships with industry leaders and local firms in the environmental and energy arenas enable the TAFE Institutes to stay nimble and responsive to shifting training needs emerging from the green economy.

The TAFE Institutes can play a critical role in a potential green sector or cluster strategy by working together to fill any regional skills training gaps that may be identified as part of the cluster analysis. Moreover, if Sydney is able to export its expertise in key green sectors such as the design and installation of green transformers or advanced water conservation and reuse measures, the TAFE Institutes could position themselves to train workers from around the Asia-Pacific region in these specialised skills and trades.

Efforts at crafting an integrated regional strategy

One of the most notable obstacles to Sydney harnessing its assets for green growth is the lack of enforceable metropolitan-level planning that draws upon a broad spectrum of stakeholders and integrates land use, environmental, economic development, transportation and other infrastructure strategies (see below). The NSW Government's *Metropolitan Plan for Sydney 2036* and Regional Development Australia-Sydney's (RDA-Sydney) recently released *Regional Plan for Sydney* represent important steps towards engaging local, state and federal government levels with key business and community groups around a shared vision for the region.[123]

RDA-Sydney is jointly funded by the Australian and NSW State Governments to advance sustainable economic development and social equity within Sydney's Regions. It is one of 55 committees that have been appointed as a result of Regional Development Australia, a recent partnership between the Australian, state, territory and local governments to support the growth and development of Australia's regions. In preparing the *Regional Plan for Sydney*, RDA-Sydney consulted with 65 organisations and drew upon information from 66 other existing plans and reports published by the federal, NSW, local governments and other key agencies. The *Regional Plan for Sydney* identifies significant challenges facing the metropolitan area and identifies next steps to address four focus areas for further engagement with key stakeholders: planning, skills development, social inclusion and economic development.[124] Pulling together all of these diverse strands into a coherent regional strategy is an essential step towards addressing the underlying infrastructure, economic development and innovation issues that can propel Sydney towards a period of dynamic green growth.

Obstacles hindering Green Growth

Underinvestment in strategic infrastructure

Stakeholders consulted throughout the OECD Study Visit to Sydney, in late 2010, consistently identified a backlog of critical infrastructure in transportation, railways, ports, airports, water and energy as significant challenges and obstacles to economic development. These findings are consistent with stakeholder feedback received as part of the preparation of the *Regional Plan for Sydney*.[125] In particular, stakeholders identified an outmoded freight transport system from the seaport as a bottleneck for growth, as well as an opportunity to substantially reduce GHG emissions and air pollution. Heavily congested roadways and a lack of consistent NSW commitment to expand passenger rail out to the growing Western Sydney suburbs were also noted as major impediments to a quality, sustainable lifestyle in the metro area. Better coordination across all levels of government is needed to resolve infrastructure problems.

The NSW Government's *Metropolitan Plan for Sydney 2036* tacitly acknowledges the issue by targeting strategic infrastructure investment "as an essential tool in improving our cities and realising future urban and economic development."[126] It calls out more efficient transport and infrastructure delivery as two of the nine challenges facing the metro area.

Poorly coordinated governance for integrated planning

A frequent refrain among stakeholders during the OECD Study Visit was that Sydney "suffers from too much government". Stakeholders often referenced the fact that metropolitan Sydney is governed by 41 separate LGAs, which carry out inconsistent and fragmented planning decisions that are often poorly aligned with the policies of the NSW and federal governments. The over-arching sentiment is well summarised in the stakeholder feedback in the *Regional Plan for Sydney:* "There are too many plans that don't align. There is a need to consolidate all existing plans/strategies into one broad plan for Sydney including funding for its implementation, delivery and management."[127]

The *Metropolitan Plan for Sydney 2036*, proposes to address this barrier by integrating land use, infrastructure and transport planning, developing detailed land use, transport and infrastructure plans for Western Sydney employment areas and integrating environmental targets into land use and infrastructure decisions.[128] It remains to be seen whether the specific implementation measures contemplated in the plan will be effective in ensuring that infrastructure investments and land use controls can manage the explosive growth anticipated in the suburban and exurban reaches of the metropolitan area.

Analysis of Sydney

Strengths

Sydney enjoys a model workforce training system

The NSW Government's leadership and clear direction in planning for green skills training and the TAFE Institutes' commitment to delivering quality green skills training are a major strength for Sydney. Sydney has the capacity to respond to changes in training needs brought on by climate change (e.g. ultra-low water usage systems) and to help transform the labour market to meet the policy-driven demands of the green economy (e.g. energy efficiency retrofit training). The close ties to industry and labour inherent in the national training system through the Industry Skills Councils and the NSW Industry Training Advisory Boards and the increasing focus on industry partnership by the individual TAFE Institutes promote a demand-driven system that is nimble and competitive.

City of Sydney is a leader in visionary sustainability policies

Sustainable Sydney 2030 represents a bold vision for a low carbon centre. Its call for coordination with other LGAs around the location of waste to energy conversion facilities and its emphasis on promoting regional renewable energy projects provides the impetus for regional collaboration among LGAs and the NSW Government.

City of Sydney is Australia's financial centre

The City of Sydney CBD is the finance and business centre of the Australian economy and is home to the regional headquarters of numerous multi-national corporations. It is Australia's "gateway to the global economy" and is one of the financial hubs of the Asia-Pacific region.[129] This could provide access to capital for emerging ventures in the green economy.

Regenerating manufacturing

The Sydney metro areas boasts important concentrations of manufacturing activity, with Western Sydney housing a large proportion of the metro area's capacity. It is a distribution hub for goods throughout Australia and has a significant transportation and logistics sector. The South Region of Sydney also includes several traditional industrial areas, which support a large manufacturing sector. Overall, manufacturing employs over 171 000 people in the Sydney region or 10.1 % of total employment. It ranks third behind health care and social assistance and retail in the number of workers employed. The industrial sector provides significant value to the economy. The average value-added per employee is approximately AUD 135 000, which is above average.[130]

There are almost 22 000 manufacturing firms in the Sydney metro area, with roughly seven employees to each firm.[131] The small average size of these urban manufacturers and their concentration in an area with good transportation connections may prove an asset in the transition to green growth. A recent study of small urban manufacturers in the United States suggests that these types of establishments

may be able to more nimbly and flexibly adapt to changes in the materials and production process associated with greening manufacturing. Their shorter and more compact supply chains suggest a smaller carbon footprint and lower transport costs than firms located in outlying and rural areas.[132] Finally, they may be well positioned to implement the types of advanced manufacturing, design and distribution changes that transition to a green economy requires.[133]

Sydney hosts a critical mass of universities and research centres

Sydney hosts five major universities and campuses of two other Australian universities, 20 Cooperative Research Centres and Centres of Excellence, including the Commonwealth Scientific and Industrial Research Organisation (CSIRO), National Information and Communications Technology Australia (NICTA), the National Measurement Institute, and the Defence Science Technology Organisation.[134]

The University of Technology Sydney hosts the Institute for Sustainable Futures, a flagship research institution working in research areas such as cities and buildings, energy and climate change, natural resources and ecosystems, transport, water and sanitation. UTS' Centre for Technology in Water and Wastewater links researchers, government, industry and community partners through research into sustainable water management in urban and rural environments in Australia and internationally. The University of NSW Sydney has a School of Photovoltaic Renewable Energy Engineering and hosts the ARC Photovoltaics Centre of Excellence in Advanced Silicon Photovoltaics and Photonics, an internationally recognised leader in the field. The University of Western Sydney Richmond's Centre for Plants and the Environment conducts research on climate change and sustainable plant production. These universities and research centres are sources of innovation that can drive the development of new technologies, products and services in the green economy.

Weaknesses

Underinvestment in strategic infrastructure

Sydney's major infrastructure assets – its seaport, airport, freight transportation and public transportation networks – require substantial new investment and upgrading to set the stage for major economic and environmentally sustainable growth in the coming decades. Existing freight operations are a major source of air pollution, traffic congestion and conflict with surrounding communities. The region needs to build new dedicated, clean transport corridors and intermodal freight facilities that remove trucks from the highway and shift goods movement to clean fuel freight rail. Suburban commuters face worsening traffic conditions and few options for public transport. Only three railway stations have been built in Western Sydney since the 1930s, despite enormous population growth during that period.[135] Investments in renewable energy facilities are critical to reducing the region's GHG emissions.

Fragmented and poorly coordinated governance structures

41 separate LGAs govern a metropolitan area of 4.2 million people (4.5 million if the Central Coast is included) without a formal structure for regional governance and community input. With some exceptions, the LGAs do not appear to effectively coordinate, plan, advocate or mobilise on a regional scale to secure resources to address regional infrastructure issues such as public transportation.

Lack of tradition of regional, integrated infrastructure, land use, sustainability, and economic development planning

The metropolitan region has lacked coordinated and enforceable planning that integrates land use, sustainability, economic development and infrastructure strategy into one vision. The recently released *Metropolitan Plan for Sydney 2036* appears to represent an attempt to integrate decision making on infrastructure, economic development, sustainability and land use planning across NSW agencies. It also aims to align sub-regional planning with the overall *Metropolitan Strategy*, and to embed regionally devised housing, employment and environmental objectives into Local Environmental Plans.[136]

Opportunities

Sustainable Sydney 2030 can generate regional expertise, SME growth and jobs in the green economy

Implementation of Sustainable Sydney 2030 could grow local expertise, jobs and SME sub-contractor expansion in planning, designing and building tri-generation, waste-to-energy and renewable power facilities. Tenders for the design and construction of the many facilities required to realise the Vision should be crafted to encourage utilisation of local and regional SMEs. Attention should be given to promoting knowledge sharing and technology transfer to local firms. The City of Sydney, the NSW Government and the TAFE Institutes might form a partnership to design training to build local contractor capacity to bid on the work. Provisions for the training and local hiring of disadvantaged workers can also be incorporated into the implementation plans. The City of Sydney can utilise the expertise of the TAFE Institutes to form partnerships for specialised and targeted training programmes to provide workers with the specific skill sets required to implement the Green Infrastructure Plan.

The opportunity presented to leverage the implementation of Sustainable Sydney 2030 for economic development purpose underscores the need for the City of Sydney to draft an economic development strategy. Such an economic development strategy could set forth the mission, values, goals and metrics for high road economic development in the capital city and guide important contracting opportunities in sustainability, green growth and other areas.

LGAs can drive demand for local green products and services

Just as Sustainable Sydney 2030 can be a driver for SME growth and jobs in the green economy, a critical mass of Sydney's 41 LGAs can increase demand for green products and services by coordinating their procurement policies and practices. The LGAs can form a purchasing consortium that targets regional SMEs for contracts and incorporates hiring targets for local disadvantaged workers.

Innovation can be linked to investment capital to support green clusters

The innovation emanating from Sydney's universities and research centres can be linked to the investment capital managed by Sydney's financial services firms to promote the spin-off of new ventures and the commercialisation of new green technologies, products and services.

Green businesses can draw on an existing manufacturing base for green supply chains

Sydney's powerful existing manufacturing base provides a competitive advantage for green start-ups and second phase firms to scale-up and expand. Researchers seeking to commercialise their innovations can draw upon a highly skilled workforce, experienced shop managers and robust supply chains. These are critical elements in growing a business and investment ecosystem that supports innovation, commercialisation and expansion.

Threats

Suburban, auto-dependent development pattern

Sydney is projected to grow to 7 million people by 2036, 4 million of whom will live in Western Sydney. Sydney's current growth and development trajectory is suburban and car-dependent. Without significant policy intervention, traffic congestion and long commutes will become a drag on the economy and pose a significant threat to Sydney's efforts to reduce its carbon footprint and grow a cleantech or other green cluster.

This threat is not unique to Sydney. For example, firms in the high-tech cluster of Oxfordshire, UK, identified traffic and congestion costs as one of the major challenges to their sector and a significant problem for high-tech firms. The lack of investment in rail and the failure to concentrate firms in centres along public transport routes was part of the overall challenge to support rapid high-tech economic growth while maintaining the environmental quality of life that represented one of the area's main assets.[137]

Sydney similarly enjoys stunning natural resources and a high environmental quality of life that are strong assets in developing the green economy. These assets may be threatened by continued lack of investment in the public transport infrastructure necessary to accommodate sustainable growth.

Inconsistent federal climate policy

The lack of clear and consistent signals from federal and state policy-makers is a threat to sustained private investment in low carbon technologies and renewable energy generation. Without a carbon tax, carbon emissions trading programme or strong renewable power mandates backed-up by significant and sustained federal investment, the region may not be able to capitalise on the potential for green job growth.

Other regions have been developing innovation centres and green clusters for several years

As Sydney attempts to align its innovation, financial, manufacturing and public policy assets to become a hub of green economic development, it will be joining a crowded field of other cities in the world that have identified cleantech and other green clusters as growth sectors. Pacific Rim cities like San Diego, California, Portland, Oregon and Vancouver, British Columbia are all potential competitors for investment capital and positioning in the green space and have formed innovation hubs and industry and research partnerships to foster green cluster development.

Recommendations for Sydney

Critical mass of LGAs should push for infrastructure investment

A major obstacle to explosive growth in Sydney's green economy is the lack of coordinated investment and planning in strategic infrastructure. *The Metropolitan Plan for Sydney 2036* describes a new approach to infrastructure planning that is promising. However, LGAs, working in collaboration with other agencies such as RDA-Sydney, should consider forming a coalition to press for investment in a few key projects around which consensus can be built. The coalition might be called something like *Move Sydney Green* and it might focus on getting an identifiable light-rail extension, clean freight rail corridor and renewable power project constructed. It could aim to investigate innovative long term financing options and more directly engage the local business community, community groups, labour and environmental advocates around a vision for green infrastructure that will generate good-paying jobs and reorient investment towards green growth (see Box 9). Move Sydney Green would be a forum to hold the NSW and federal governments accountable for delivering sustained and strategic infrastructure investment to the region.

Box 9. Green Infrastructure Investment – An Opportunity to Reorient Towards Green Growth

A recent OECD analysis of lessons learned from stimulus packages notes that the increased difficulties in financing infrastructure projects in a time of risk-averse markets and large public deficits may present an opportunity to facilitate the development of green technologies and industries. Tight credit and closer scrutiny of projects may mean that projects that improve road or rail connections, enhance efficiency improvements of intermodal transport linkages, or use intelligent traffic management systems to reduce CO_2 emissions at ports and other major transport facilities may receive higher priority.[138] There is also great potential to develop greener infrastructure through smart metering of water consumption, smart grids in the electric industry and building eco-friendly green infrastructure to absorb storm water flows rather than more costly grey infrastructure treatment systems.[139] Cost-effective solutions to infrastructure deficiencies might naturally lead towards reorienting investment towards eco-friendly approaches that support green growth.

Dive deeper into identifying and supporting clusters in the Green Economy

A variety of planning and strategy documents prepared by labour unions, environmental groups, local, state and federal governments have called out a number of green sectors as key potential markets for Sydney and Australia. For example, the Australian Conservation Foundation and Australian Council of Trade Unions identified renewable energy, energy efficiency, sustainable water systems, biomaterials, green buildings, and waste and recycling as six growth markets in their *Green Gold Rush* report.[140] The NSW Government's *Metropolitan Plan for Sydney* 2036 sets forth a goal of working with "councils and business to develop a renewable energy design and manufacturing cluster and a sustainable housing service cluster."[141]

The NSW Government, RDA-Sydney, the TAFE Institutes and the City of Sydney should work together on a green cluster-oriented economic development programme that builds on existing regional assets and fosters collaborative dynamics among key stakeholders. The effort should avoid being overly broad. It should use data and analysis to identify valuable clusters within the green sector in which Sydney has a truly competitive, distinctive specialisation. The effort should use market analysis to document the natural presence of clusters, their global positioning, and their export intensity.[142] It should focus on identifying the types of policy interventions that will address institutional and capacity gaps in the cluster's ecosystem of innovation, start-up, finance, commercialisation and scale-up.

Form Industry/University/Capital/Government/Labour Consortium to support innovation in targeted green clusters

Sydney should build on the human capital and innovation advantages presented by its critical mass of universities and research facilities by creating a network or consortium focused on fostering and supporting a culture of innovation and collaboration in targeted green clusters. The consortium should include representatives of universities and research institutions, venture capital and financial firms, key industry leaders, policy-makers and labour. The aim should be to increase communication flows among the participants and facilitate the transfer of innovation from research institutions to commercialisation. The consortium should work closely with start-up firms and established businesses in the targeted clusters to identify training, infrastructure and investment needs to support expansion. The consortium can be the focal point for advocacy at the local, metropolitan, state and federal level that drives for more consistent, coherent and aligned policies in support of innovation and green growth.

Leverage Government's procurement power to drive green demand.

A coordinated procurement policy by key Sydney institutions can support local green SMEs and support a pipeline for unemployed and disadvantaged workers coming through green skills training in the TAFE Institutes. A procurement policy is the set of rules and regulations an organisation sets in place to govern the process of acquiring goods and services. Local government contracts for the purchase of goods may provide opportunities to leverage government purchasing power to obtain concessions from suppliers. For example, the Clinton Climate Initiative Purchasing Alliance leverages the buying power of its network of city participants to negotiate price reductions from manufacturers of best-in-class energy efficient building products, such as heating, ventilation and cooling (HVAC) systems and lighting products.[143]

Procurement policy can also be designed to drive public policy or social equity goals. Some municipalities use responsible bidder provisions to require that all contractors comply with anti-corruption, labour, employment, anti-discrimination and environmental laws. Other localities go further and add more explicit requirements such as a percentage of recycled content in products, purchasing only non-polluting vehicles, or ensuring that contractors pay their employees a "living wage" that is above the minimum wage and that they do not engage in sweatshop practices.[144]

Because the budgets of LGAs other than the City of Sydney are relatively small, it will be essential that Councils coordinate to form a consortium to maximise the influence of their purchasing power. Tenders can include incentives for hiring unemployed and disadvantaged workers who have been trained at TAFE Institutes in specific occupations. LGAs can include bidding preferences for local SMEs that provide green goods and services. Energy Australia, Integral Australia and other government-owned entities can also play a critical role in directing investment to support local innovators and small and medium sized firms. Aligning procurement practices with sustainability policies and an economic development strategy can amplify public institutions' ability to drive demand and foster a green marketplace.

Conclusion

Sydney exhibits many of the seven key elements in driving a sustainable economic development strategy that generates good-paying jobs in the green economy. Some refinements and reinforcements of key concepts will strengthen Sydney's capacity to deliver green growth to its residents and businesses.

First, the City of Sydney's Sustainable Sydney 2030 plan articulates a clear vision for a lower carbon economy. This document can act as a starting point for the formation of a regional forum that brings together a critical mass of other LGAs around a shared vision for green growth. The shared vision should emphasise harnessing the investment and economic development potential of a green growth strategy in order to expand its potential to support local SMEs and create green jobs.

Second, plans by the NSW Government and RDA-Sydney indicate that they have begun to focus on supporting green cluster development. This could be strengthened through careful data and market analysis to address institutional and resource gaps hindering the development of specific green clusters.

Third, the Sydney metro area's biggest obstacle to green growth is the need for investment in strategic infrastructure that will enable that growth. The *Metropolitan Plan for Sydney 2036* outlines good first steps towards driving more integrated strategic investment, but the active involvement of local Sydney stakeholders will be essential to holding the NSW and federal governments accountable for making the necessary sustained and substantial investments.

Fourth, Sydney is perhaps strongest in its demand-driven workforce training system. It benefits greatly from the coordination between DECCW and DET in setting goals for and targeting directed

investment in green skills training. If Sydney embarks on a focused green cluster strategy, the TAFE Institutes could play a significant role in meeting any skills gaps identified by a cluster analysis.

Fifth, RDA-Sydney has identified the need to build institutions such as Global Connect to foster innovation and build on the region's educational and research assets. The establishment of some type of forum or consortium that engages business, academia, labour, venture capital, and key policymakers at the local and state level may provide the focus and direction necessary to support the culture of innovation and investment that will be crucial to positioning Sydney as a leading green technology or cleantech hub.

Sixth, the LGAs, TAFEs, Energy Australia and other major governmental institutions in the Sydney metro area could do more to leverage their purchasing power and align their policies and regulations to support the growth of SMEs in the green economy and create more local green jobs.

Finally, the extensive community engagement conducted by the City of Sydney to produce *Sustainable Sydney 2030* and the consultative process used by RDA-Sydney to develop the *Regional Plan for Sydney* are good examples of the type of deep engagement necessary to build sustained support for transformative green growth policies.

ANNEX: LEARNING MODELS

This section provides some practical examples (learning models) to the Sydney partners to illustrate some of the approaches and recommendations suggested in the report. These models cannot necessarily be replicated in Sydney, as the local context needs to be taken into consideration. However, these models do intend to provide some practical guidance on how similar challenges were dealt with in other places that could be of inspiration for Sydney. Table 8 summarises the examples included in this section:

Table 8.   Synthesis of learning models

Model	Region (country)	Recommendation/Approach
Retrofit Employer Accord Pilot (REAP)	London (UK)	A citywide retrofitting programme to make CO_2 emissions savings and open up job opportunities.
Twin Cities Initiative on Green Manufacturing	Minneapolis / Saint Paul (USA)	Strategy to become a world leading city in a specific area
Labour market analysis of green jobs	London (UK)	Decide the most appropriate way to define green skills and determine the number of green jobs and skills in the economy
The California WE&T Needs Assessment	California (USA)	A state-of-the-art workforce education and training assessment undertaken as part of a wider strategy focusing on energy efficiency goals.
Local Enterprise Partnership	England (UK)	Empower communities, connect people to jobs and provide the skills needed to create and shape a dynamic and entrepreneurial local economy
Lindoe Offshore Renewables Centre	Syddanmark (Denmark)	Develop physical and human assets into a world-class facility in an emerging technology for sustainability
Education Employment Linkages Research Programme	New Zealand	Education systems help young people prepare themselves for new opportunities being created in the green economy.
CleanTECH San Diego	San Diego (USA)	An organisation with major stakeholders to accelerate green business formation, leverage intellectual property, promote networking in the green economy
The Pecan Street Project	Austin (USA)	A collaborative project among a city, a public utility, a university, businesses and an environmental organisation to leverage the public utilities for broader green growth purposes
Regional Growth Strategy	Vancouver (Canada)	Shared governance around planning and infrastructure

Retrofit Employer Accord Pilot, REAP (London, United Kingdom)

Description of the model

The Retrofit Employer Accord Pilot (REAP) aims to apply an employer engagement brokerage model to the emerging low carbon sector in London (building on the success of the London Employer Accord) by linking the skills and employment opportunities arising from the Mayor's key carbon reduction retrofitting projects RE:NEW (Building Energy Efficiency Programme) and RE:FIT (Homes Energy Efficiency Programme) to help London's long-term workless population to benefit and find jobs.

The REAP project employed six employment brokers working across London to support the employer base working on RE:NEW and RE:FIT in order to open up potential job vacancies to local unemployed people. An employment broker linked specifically to the RE:NEW programme operates in each of the five housing sub-regions in London and an additional broker whose focus is the RE:FIT programme will sit within the London Employer Accord team at the LDA. The model in Figure 15 shows how the broker role will add value to existing provision.

Figure 15. **Retrofit Employer Accord Pilot: Delivery Model Considerations Jan. 2010 – March 2011**
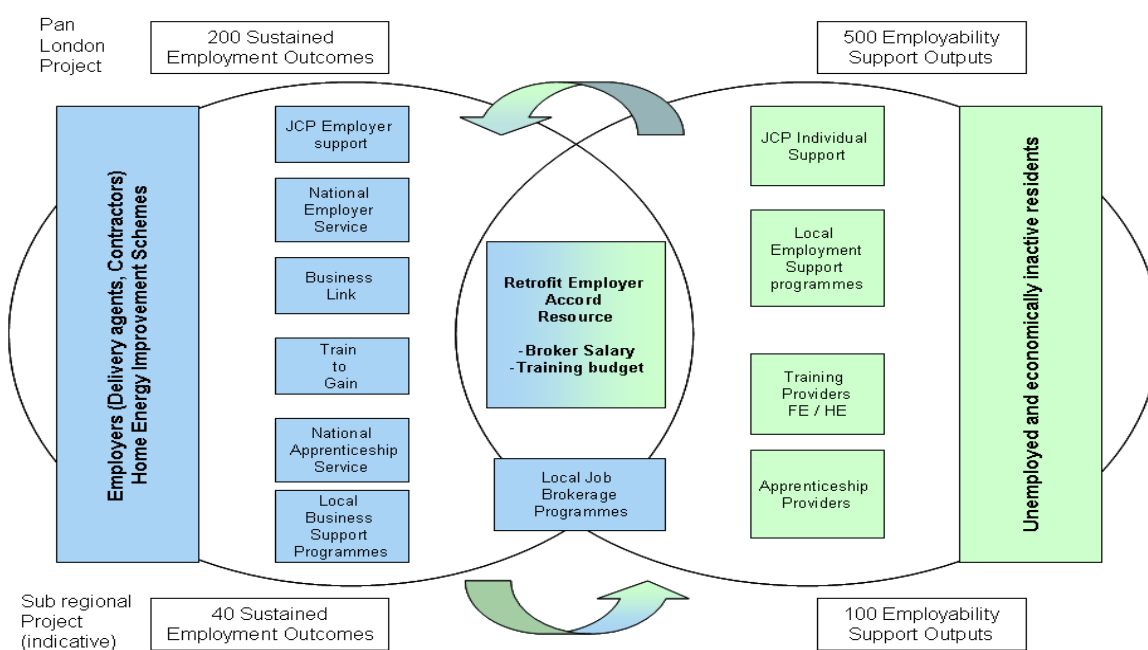
Relevance to Sydney

The evidence suggests that Sydney will be able to make considerable CO_2 emissions savings by retrofitting commercial and residential buildings across the city. Local Government Authorities have recognised this and are implementing this approach. A citywide retrofitting programme is likely to open up significant new job opportunities and some of these opportunities could be made available to unemployed people, and particularly young people, to tackle high levels of youth unemployment. This approach could potentially provide a double dividend by reducing CO_2 emissions and helping unemployed people into work.

Results of the approach

The Employer Accord approach in London has been extremely successful and has helped place 1,500 people into work in two years. The REAP project was piloted to test the feasibility of applying this model to the emerging green sector to see if unemployed people were able to benefit from these new opportunities. Unfortunately, the Mayor's RE:NEW and RE:FIT projects were delayed, but, despite these projects being put on hold, the programme was still able to provide skills training and jobs for unemployed people in retrofitting.

Since its inception in early 2010, 350 people have received skills and employment support to prepare them for retrofitting opportunities. Of these, 50 have found jobs with contractors delivering retrofitting projects in London and, as demand increases amongst the newly appointed RE:NEW and RE:FIT contractors, job outcomes are forecast to increase. To date, 50% of starters on the programme are from Black, Asian and Minority Ethnic groups (generally these groups are more disadvantaged in London) with 60% being unemployed for six months or more (over a quarter of total starters had previously been out of work for a year or more).

Reasons for success

The objective of the programme was to evidence that green jobs were realistic opportunities for unemployed Londoners, using an employer engagement model. The programme has demonstrated that with short-top up courses and intensive employability support unemployed people can benefit from jobs in the emerging green economy.

Anecdotal evidence from the REAP brokers suggests that many employers had not considered using the Public Employment Service or government back-to-work contractors to fill vacancies, and that going forward they would be more likely to do so if support (including training as well as recruitment) was tailored to their needs and they could concentrate on running their businesses. Moreover, the ability to draw down public sector training funding to help in the up and re-skilling of potential candidates pre-employment was very useful. This approach has been successful without the demand side intervention where direct job opportunities would have been created. However, in the coming months as the RE:NEW and RE:FIT projects begin to deliver jobs, graduates of this programme are well placed to benefit.

The approach is a useful learning model for other OECD regions because it provides evidence to support the feasibility of a double dividend from programmes to reduce emissions and help people into work if managed appropriately. Similarly, the jobseekers who were interviewed by brokers also suggested that they had not considered retraining or up-skilling to work in this sector and that existing IAG available in London often lacked any detail on green job opportunities, something that a targeted programme was able to provide.

Obstacles faced and response taken

The major obstacle faced by the programme in London was the postponing of the Mayor's RE:NEW and RE:FIT programmes due to the UK's 2010 Comprehensive Spending Review. This resulted in many of the forecast job opportunities that this programme was developed to fill being postponed. To overcome this, REAP brokers sought job opportunities in retrofitting businesses outside of these Mayoral projects. The brokers have been successful in matching 50 people with jobs and stimulating the key businesses in the market to the opportunities provided by unemployed people. As these approaches are rolled out more widely the Greater London Authority will build future local employment and skills requirements directly into the contracts as part of their Responsible Procurement code.

An additional issue was the level of awareness of the Public Employment Service of new and emerging sectors in the economy, including green jobs. This suggests a considerable knowledge gap between front-line advisors in the mainstream system potentially limiting the number of jobs opened up to unemployed people. The brokers overcame this by engaging directly with front-line advisors locally and developing a range of marketing tools outlining the offers and scale of the potential future job opportunities.

Considerations for adoption in Sydney

This project could be relatively easily adapted to the Sydney context. Currently there is a strong focus across the city on retrofitting "brown" buildings and investing in the infrastructure to improve energy efficiency. For instance, in the City of Sydney Authority alone there is a particular focus on installing new photovoltaic sites and a commitment to further lowering the carbon footprint of large commercial and public buildings through the Better Buildings Partnership. This suggests that the demand side of the interventions is already healthy. By using responsible green procurement practice it could be possible to build-in requirements for future contractors to ring fence a percentage of jobs in each of the contracts for local unemployed people to benefit from the "greening" of the city.

On the supply side, REAP could be replicated to act as a broker to match local unemployed people (particularly young people) with these potential employment opportunities. Part of the commitment by the public agencies in Sydney could be to ensure that local unemployed people were able to undertake relevant skills training provided by the TAFEs for these green opportunities, before being matched to a potential employer.

In order to develop a pan-city project, the LGA in Sydney would be required to offer up a proportion of ring fenced job opportunities for the unemployed as part of any future retrofitting and new energy efficiency projects. TAFEs could work with local employers to identify a series of short bite-size skills training products matched to the skills required by the local employers to fulfil the contractual obligations. The brokerage operation could be run either at a pan-city level or on a sub-regional basis housed within LGAs. Their role would be to match the supply side intervention with the demand generated by public and private sector investments.

Further information

Key places for further information:

- Overview of the London Development Agency's Low Carbon Employment and Skills Programme - http://www.lda.gov.uk/projects/low-carbon-employment-and-skills/index.aspx

- Investing in London's low carbon future - http://www.lda.gov.uk/our-work/low-carbon-future/index.aspx

- Contact: Aminata.Diaby@LDA.gov.uk for further information on REAP and the LDA Low Carbon Project

- Overview of the London Employer Accord Brokerage model http://www.londonemployeraccord.com/

Twin Cities Mayors' Initiative on Green Manufacturing (Minneapolis and Saint Paul, USA)

The Mayors' Initiative on Green Manufacturing highlights a best practice model in transforming a declining manufacturing sector across two cities into a thriving clean tech centre generating local green growth and jobs.

Description of the model

In April 2006, Ford announced its intention to close a major auto manufacturing plant with several thousand employees in Saint Paul. Before the end of the year The Mayors of St Paul and Minneapolis came together with the Blue Green Alliance to launch a new task force to become the industry centre for clean tech in the US.

The initiative undertook a deep dive review, *Making it Green*, to explore the potential opportunities associated with green growth and an analysis of the existing strengths and weaknesses of both cities. From this analysis the Two Mayors' initiative decided to focus on three key areas for future growth: a) **the manufacture of green products** for construction and retrofitting; b) **renewable energy**; and c) **green transportation options**. Against each priority area a sub-committee was tasked with leading a more detailed plan to deliver against the ambitions of the initiative.

In order to develop this strategy further, and to gain first mover advantage, the cities executed the following five steps:

- aggressive marketing campaign with the strap line "Making it Green in Minneapolis & Saint Paul";
- realigning the cities' economic development tools to focus on the green "industries of the future";
- growing receptive markets for these green manufacturers by sharpening procurement and public policies;
- coalescing State Policies and Programmes by creating a set of state policies and incentives to support the creation of green jobs in Minneapolis and Saint Paul; and
- adopting and strengthening the culture of innovation and partnership of the cities of Minneapolis and Saint Paul with the on-going work of the Mayors' Green Manufacturing Initiative through a restructured Mayors' Green Manufacturing Development Team.

Phase I was followed by Phase II, which looked to act on some of the findings and execute a strategic implementation plan called Thinc.Green MSP as the leading initiative to help retain, grow and attract green manufacturing businesses and jobs in the Minneapolis Saint Paul region. Thinc.Green MSP is now the region's accepted private-public voice for green manufacturing.

The initiatives associated with Thinc.Green are aimed at driving the growth of local green manufacturers through government purchasing; implementing building standards and incentives; aligning industrial zones with green assets; providing finance to start-up companies; and a recognition programme for green manufacturers.

Relevance to Sydney

Whilst the "Two Cities" learning model originated under different circumstances to those found in Sydney today (i.e. out of significant jobs losses in the manufacturing sector due to deindustrialisation), the ambition of the Sydney partners for Sydney to be a world leading city for sustainability closely aligns with the ambitions of Minneapolis and Saint Paul to be a clean tech leader in the US. The model is a strong example of one region's efforts to expand its green manufacturing base. It provides excellent sources and frameworks for an assessment of local opportunities, insight into the broad partnerships necessary for this

kind of effort, and a timely review of innovative best practices. It is a good model for local coalitions developing recommendations to create their own green economies, but may be more relevant for larger cities with more developed sustainability efforts in place, such as Sydney.

Results of the approach

The approach has successfully delivered a step change in the fortunes of the two cities in relation to the Green economy. Minneapolis and Saint Paul have successfully re-positioned their cities as green leaders in the US and supported the growth of new green industries, generating jobs and economic growth. In addition Minneapolis has:

- Cut Electricity use by City-owned buildings by 2% from 2008 to 2010, while natural gas use declined by 10%. Throughout Minneapolis, electricity and natural gas usage was lower in 2010 than in 2008.
- In 2010, the City issued the highest number of renewable systems permits ever: 28 solar photovoltaic (electricity) permits (compared to two in 2009), four solar thermal permits and 19 geothermal system permits – all increases from 2009.
- In 2010 approximately 4,500 people worked in "green jobs" with forecast growth estimating that this will reach beyond 6,000 jobs by 2013.

Reasons for success

Evidence suggests that strong senior leadership and engagement (by both Mayors) was a key component of the success. This leadership was pivotal in ensuring other parties were engaged and sent out a strong message about the seriousness of the initiative to key stakeholders and businesses.

Officials also suggested that early engagement and active inclusion of a wide group of stakeholders significantly aided the process and created opportunities that would not have surfaced in a narrower process involving just one city's economic development staff. It appears that this process enabled individuals and organisations to establish relationships and broadly agree on a consensual tow city strategy for the region.

Considerations for adoption in Sydney

The approach set out under the Two Cities Mayors' Initiative is a best practice example of how to develop and execute a joint sustainability strategy. The process by which this strategy was developed could be applied in a Sydney context to drive forward a pan-city sustainability strategy. The starting point in Sydney would be slightly different to the political mandate in the Two Cities, but a Sustainability Forum could be the initial home to the early analysis. It appeared that an informal grouping on sustainability was beginning to take place and this could be the first step to a more strategic group as appetite for a more senior group develops.

Further information

- Making it Green report: http://c0133311.cdn.cloudfiles.rackspacecloud.com/Report%20-%20Making%20It%20Green%20in%20Minneapolis.pdf

- Press notice on Thinc.Green
  http://www.ci.minneapolis.mn.us/mayor/news/20100622newsmayor_mayorslaunchthincgreen.asp

- Overview of Twin Cities Mayor's Initiative:
  http://www.iscvt.org/resources/documents/twin_cities_mayors_initiative.pdf

- Impact in terms of sustainability, Minneapolis:
  http://www.ci.minneapolis.mn.us/sustainability/docs/2011GreenprintReport.pdf

- http://www.bluegreenalliance.org/admin/private_publications/files/Market-Analysis-vFinal.pdf

- Blue Green alliance: http://www.bluegreenalliance.org/

Developing labour market analysis of green jobs (London, United Kingdom)

Description of the model

The Mayor of London and the London Development Agency were keen to develop a more refined understanding of the labour market potential of moving to greener growth in London. In order to do this the LDA worked alongside Innovas and DTZ to define and develop a working definition of the low carbon economy and the number, type and skills levels of low carbon jobs in the London labour market.

The London Study drew on Innovas's seminal work defining the low carbon and environmental goods and services (LCEGS) in the UK using experimental new market data on the environmental economy in the UK, its regions, and internationally. This Innovas study draws from over 720 sources. It includes activities undertaken by companies across the whole environmental supply chain, from R&D, through manufacturing into distribution, retail, installation and maintenance services. Companies are included in the supply chain where 20% of their turnover is supplied into the LCEGS sector, but importantly only the sales activity relating to this sector is included in this study. The study uses 'bottom-up' data based on what companies actually do, rather than what they are classified as doing under the SIC system. In doing so, it identifies and measures 2490 Environmental, Renewable Energy and Emerging Low Carbon activities within 23 sub-sectors.

Table 9.   Definition of low carbon jobs (excluding carbon finance)

Broad heading	Activity
Energy efficiency	Energy management
	Building technologies
Energy supply	Alternative fuels
	Geothermal
	Biomass
Renewable energy	Solar
	Wind
	Wave and tidal
	Hydro
	Biomass
	Geothermal
Waste and waste to energy	Waste management
	Recovery and recycling

The definitions outlined in Table 9 include two further levels of granularity. Level 1 applies to the broad sector split within low carbon. Level 2 applies to the sub‑sector breakdown of activity and Level 3 applies to a sub‑sub‑sector breakdown (See LDA 2010). This methodology was then applied to London in order to determine the size of activity and number of businesses in each category starting with Level 3 and working up to Level 1 definitions. The model also enabled London to assess the number of employees working in the low carbon sector.

In order to forecast future potential the model uses a range of external sources such as investment houses, specialist organisations and trade associations and can be considered a 'consensus view' of average market expectations. The accuracy of the forecasts is reviewed by Innovas, who compare them with actual rates of change that are observed, removing those sources that have been shown to be unreliable over time.

To map skills of the existing low carbon workforce in London, DTZ have taken the average from two methodologies and concentrated on core businesses only:

- estimated the skills breakdown based on published statistics and an assumed relationship between Standard Industrial Classifications and our definition of sectors in the low carbon economy; and

- extrapolated the skills profile of DTZ's survey of low carbon businesses in London.

Relevance to Sydney

Sydney has yet to decide on the most appropriate way to define green skills and apply a methodology to determine the number of green jobs and skills in its economy. The approach adopted by London and developed by Innovas and DTZ is new and interesting. It draws on new market data to develop a bottom-up picture of the low carbon sector without having to try and classify occupation and industrial classifications. In effect, it maps business activity and is a therefore a more accurate account of activity. Whilst this approach may not be suitable for Sydney it offers an alternative and experimental approach to mapping green jobs and skills in the economy.

Results of the approach

The approach has provided a robust evidence base for low carbon activity in London's labour market and was unanimously endorsed by key experts in the green economy in London and across the UK. The London Low Carbon Forum signed off the initial evidence base in 2010. The forecast methodology used has also proven relatively robust in the most recent up-date to the data, showing only a marginal variance between the 2010 growth figures and those forecasted.

Applying this methodology to calculate skills in the workforce also yielded interesting results (see Figure 16). London's low carbon workforce skills profile is characterised by high skills, with more than 1 in 2 employees having a degree or above. However, almost a third of all jobs are at Level 2 (basic high school diploma) or below suggesting that they are accessible to low skilled workers in the labour market. The sectors with the lowest skilled vacancies are recovery & recycling, waste management and building technology.

Figure 16.   Skills profile of London's low carbon sector
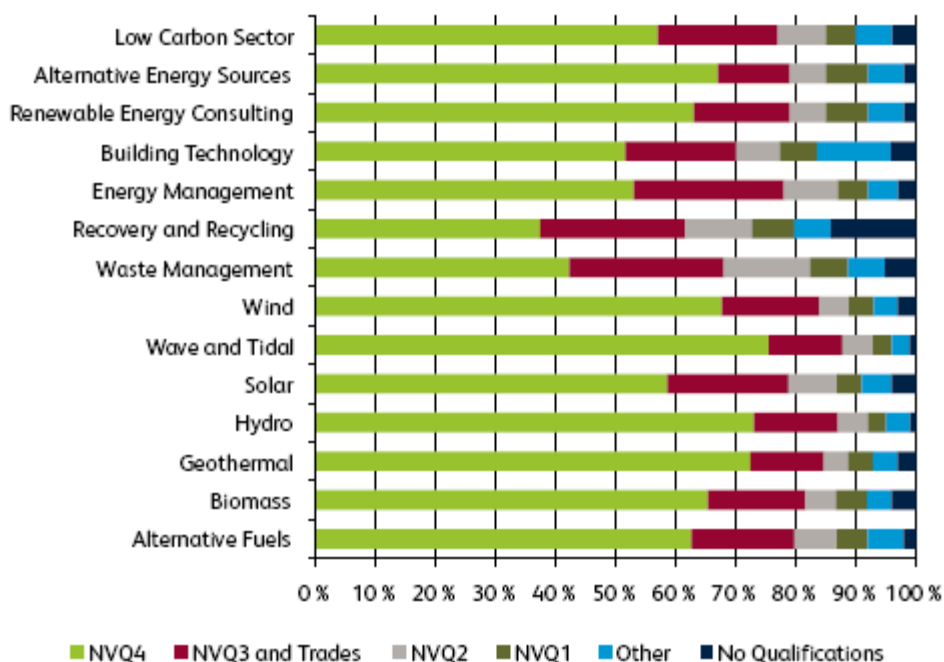
Source: APS, DTZ Business Survey and LDA Calculations

Reasons for success

The objective of the research was to build an evidence base on the London low carbon economy and jobs market. This evidence base has withstood scrutiny and formed the foundation of knowledge on the low carbon economy and policies to help people into low carbon jobs. Working closely with key stakeholders from across local, central and regional government, academia, education and IAG professionals has embedded these findings into the work of planners and policy makers.

Obstacles faced and response taken

The major obstacles faced revolved around agreeing definitions and ensuring that, despite the experimental nature of the methodology, they were robust and accurate enough to stand up to public and academic scrutiny. Engaging with key academics early and allowing them to interrogate the analysis aided its validity later in the process.

Considerations for adoption in Sydney

Whilst this approach is somewhat experimental it has been deemed a huge success in London and the UK. It offers an alternative take on measuring the extent of green activity in the economy by approaching the analysis from a largely demand perspective. The data used is more up-to-date than other methodological approaches and it responds quicker to economic shocks, changes in consumer behaviour and policy environments. In determining the most appropriate definition and evidence base for green jobs in Sydney it would be worthwhile exploring a range of different methodologies including this approach, although its usefulness will depend on the main policy drivers for designing a definition.

Further information

Key places for further information:

- Developing an evidence base for Low Carbon skills and employment
  http://www.lda.gov.uk/projects/low-carbon-employment-and-skills/index.aspx

- Green Expectations - http://www.lda.gov.uk/publications-and-media/publications/green-expectations-londons-low-carbon-job-prospects.aspx

- DTZ / Innovas study
  http://www.lda.gov.uk/Documents/Skills_for_a_Low_Carbon_London_-_September_2010_9720.pdf

- Innovas Low Carbon Environmental Goods and services sector: industry analysis
  http://www.bis.gov.uk/files/file50254.pdf

Contact: Aminata.Diaby@LDA.gov.uk for further information on LDA Low Carbon Projects

The California WE&T Needs Assessment (California, USA)

Description of the model

In September 2008, the California Public Utilities Commission (CPUC) approved the California Long-Term Energy Efficiency Strategic Plan to scale up energy efficiency efforts designed to meet California's clean energy challenges and goals. Associated with the Plan was a vision that "by 2020, California's workforce is trained and fully engaged to provide the human capital necessary to achieve California's economic energy efficiency and demand site management potential". Consequently the CPUC commissioned a California Workforce Education and Training Needs Assessment for Energy Efficiency, Demand Response, and Distributed Generation (the WE&T Needs Assessment) undertaken by the Donald Vial Center on Employment in the Green Economy at the University of California, Berkeley.

The research considered the effects of energy efficiency and related policies on both the demand and supply sides of the region's labour markets using a mix of quantitative and qualitative methodologies. The first area of research analysed the impact of federal and state energy efficiency policies and programmes on jobs and the labour market. The second area of research was a comprehensive assessment of California's workforce development system and its collective capacity to provide workers for the jobs created or transformed by energy efficiency and related policies and programmes. The final part of the study identified lessons learned and recommendations for action.

The research process included a presentation of preliminary results and recommendations at a Workforce Strategies, Energy Efficiency, and Green Jobs Summit on 8 December 2010, which offered opportunities for feedback through participatory workshops and solicitation of comments. The Summit was guided by a stakeholder committee that included the CPUC Commissioner, legislative leadership staff, and key policymakers and stakeholders in the workforce development and energy communities. Thus the final report released on 17 March 2011 aimed to reflect broad (though not universal) agreement among stakeholders on the major issues and recommendations.

Relevance to Sydney

This programme is relevant to Sydney because it represents a state-of-the-art workforce education and training assessment undertaken as part of a wider strategy focusing on energy efficiency goals. The study was carried out through close collaboration among the region's public agencies, major employers, unions and other workforce experts working in partnership with lead consultants providing specialist analytical services through the University of California. It therefore serves as a model for recommendations in the report that are based on the principle that skills training for sustainability should take advantage of genuine market opportunities.

Results of the approach

The final report was released on 17 March 2011. The main results support a very cautious approach to designing new training programmes. The report finds, for example, that from a total job creation forecast of 211,000 workers in 2020, the number of new slots available for workers needing specific skills in energy efficiency and related activities is only 5,262. Further, it found that the number of workers currently employed in energy efficiency and related occupations far outweighs the number of new workers that are projected to enter these fields through 2020. Consequently, the report concludes that the focus should be on upgrading the energy efficiency skills and knowledge of the incumbent workforce.

Reasons for success

The major success of the project was its achievement of a broad consensus among stakeholders on the major issues and recommendations. There were three elements that contributed to this success. First, the comprehensive analytical work was carried out by an authoritative research team based in one of the region's prestigious institutions of higher learning. Second, the research team supplemented the quantitative analysis with qualitative case studies of three critical energy efficiency related markets, involving key stakeholder interviews of employers and training providers. Third, preliminary results were presented at a seminar of more than 250 stakeholders from the workforce and energy communities, which provided a forum for discussion of the key findings and recommendations and possible next steps.

Obstacles faced and response taken

In developing its assessment, the authors of the report took into account two major problems affecting the California economy: (1) a high unemployment rate of over 12 % as of early 2011; and (2) a long-term structural bifurcation in the state between well-paid, higher-skill jobs and low-wage, lower-skill jobs. A number of the report's conclusions address these issues, aiming to pursue a 'high-road' strategy to encourage well-paid, higher-skill jobs that are accessible to currently disadvantaged workers and job seekers.

These recommendations are at a relatively high level. An example is a recommendation to "award state and utility direct-install contracts using a best-value contractor rating system that includes documented history of high-quality work, hiring of workers with appropriate certifications, on-going investments in worker training, and compliance with building codes and employment laws". Another example is: "Adopt as a goal for the Energy Training Centers the inclusion of low-income, minority, and disadvantaged workers and job seekers. Develop and implement specific programs in collaboration with organizations that have a track record in this arena, emphasizing sector strategies that can lead to placement in good jobs with career ladders."

Considerations for adoption in Sydney

The SWOT analysis of Chapter 3 noted that the Government of New South Wales (2010) and the City of Sydney (2010) have each adopted visions around a low carbon or green economy. The California WE&T Needs Assessment offers a model of how these high-level visions can be translated into information about their implications for workforce education and training. It would require a lead public agency, such as the NSW Department of Education & Training, to provide funding for a comprehensive needs assessment undertaken by a collaborative team of major stakeholders drawing upon the analytical expertise of labour market researchers at one of the city's universities.

Further information

Further information on the WE&T Needs Assessment, including PDF copies of the final report and its appendices can be obtained at www.irle.berkeley.edu/vial/. The study manager was Dr Robin J. Walther. A copy of a presentation by Dr Walther on the WE&T Needs Assessment project can be downloaded at www.energy.ca.gov/2010_energypolicy/documents/2010-07-21_workshop/presentations/04_Study_Mgr-Walther_Presentation.PDF.

Local Enterprise Partnerships (England, UK)

Description of the model

On 28 October 2010, the Secretary of State for Business, Innovation & Skills in the United Kingdom published the Local Growth White Paper, *Local Growth: Realising Every Place's Potential* (HM Government, 2010).[145] This confirmed that the Government would phase out Regional Development Agencies and replace them with a series of smaller local enterprise partnerships made up of local businesses working in partnership with a combination of local authorities across natural economic areas. At the time of writing this report, 31 partnerships had been agreed, covering 87 % of the United Kingdom population, 1.8 million businesses and 20 million employees.

The White Paper sets out the underlying principle of the new approach (HM Government, 2010, p. 9):

> Underlying our new approach is a strong belief that the role of the individual matters as much, if not more, than the role of place. Government and individuals themselves must improve the options available to them and in so doing enable everyone to contribute to, as well as benefit from, the opportunities arising from economic growth. We are asking local partnerships, led by business, to develop a strategy for growth that uses and grows local talent, meets the needs of local people, and helps to contribute to national economic growth.

A key feature of the new approach for this study is that the local enterprise partnerships are intended to play a pivotal role in skill needs identification, as explained in the White Paper (HM Government, 2010, pp. 48-49):

> The Government is committed to freeing colleges and training organisations from central control and bureaucracy, so they can decide the training offer which responds directly to what well informed individual learners and employers want. Colleges and training organisations will be encouraged to form self-organised networks so they can engage more easily with local enterprise partnerships to agree skills priorities and how they can best be delivered. The priority is to develop networks of flexible and responsive colleges and training organisations where the relationship between the college or training organisation and their direct customers takes primacy and colleges are free to respond to the real demand demonstrated by employers and individual citizens.

Relevance to Sydney

This policy initiative is still in an early stage of implementation. Each agreed local enterprise partnership must set up a Board for recognition by Government Ministers and this process is still underway. Nevertheless, the ideas behind this initiative represent an important international development in approaches to skills training for sustainability that may have resonance with issues being addressed by agencies in Sydney.

In particular, the White Paper sets out a mechanism that intends to "put businesses and local communities in charge of their own futures, give greater incentives for local growth and change the way central government supports and maintains growth" through an approach that aims to "connect people to jobs, help them get the skills they need and equip local areas with the tools they need to create and shape dynamic and entrepreneurial local economies" (HM Government, 2010, p. 5). Such an approach could be relatively easily incorporated within the 'skill ecosystem' framework developed in New South Wales by strengthening the role of RDA Sydney, which already has a mandate "to advance sustainable economic development and social equity within Sydney's regions" (www.rdasydney.org.au).

Results of the approach

The approach aims to create a partnership between central government and local enterprise partnerships, with each addressing different issues in the green economy (HM Government, 2010, p. 44). The Government's approach to policies for growing the green economy will be based on the following elements:

Low carbon, green innovation – innovation is particularly important to the development of the green economy, given the fact that many of the technologies are new and require further investment in research, development and demonstration (R, D&D) before they are ready for market. Strategic innovation investment will be taken forward centrally, including support for nationally significant research, demonstration and testing centres.

Green infrastructure – local enterprise partnerships will need to consider what local infrastructure issues they can address to enable growth in this area. Many low carbon infrastructure projects will cross local enterprise partnership boundaries, for example, grid infrastructure, ports infrastructure (for renewable energy manufacture and deployment) and Carbon Capture and Storage. Where this is the case, particularly where there are large infrastructure issues, these will be best taken forward nationally.

Stimulation of supply chains – the Government's role will include facilitating the development of UK-based supply chains in developing green markets where there are significant opportunities, but information barriers exist. This includes offshore wind, marine energy and the civil nuclear industry. The Government will look to provide local enterprise partnerships and industry with information and support to ensure that businesses throughout the country are made aware of emerging business opportunities.

Green Low Carbon Clusters – it will be for local enterprise partnerships to make the most of their areas of strength or comparative advantage. This will often mean local enterprise partnerships playing a co-ordinating role, bringing together industry with local partners such as skills bodies, planning, and business. Central Government can play a role in supporting local enterprise partnerships with information about supply chains (as described above) and in helping local enterprise partnerships join with other relevant institutions elsewhere in the country, for example academic institutions with expertise in particular sectors or technologies.

It is too early to evaluate whether this partnership will be effective in practice, but its intention of using local enterprise partnerships to identify local areas of strength or comparative advantage in the green

economy is consistent with fundamental principles of endogenous regional economic development. The White Paper envisages that this work will extend to ensuring that training provision is consistent with its strategic priorities (HM Government, 2010, p. 49):

> We will encourage local enterprise partnerships to develop effective working relationships with the further and higher education sector and engage directly with their networks of colleges and training organisations in order to agree how to generate the demand for agreed strategic priorities locally – which may include helping to build employer ambition through spreading good practice – and to agree with learning providers and other stakeholders action to ensure provision meets demand.

Reasons for success

It is clearly too early for any evaluation of whether the initiative will succeed. Nevertheless, Section 1 of the White Paper presents a strong case for the new approach based on the principal that "where drivers of growth are local, decisions should be made locally" (HM Government, 2010, p. 5). This is an important issue for Sydney, which this report identifies as having specific opportunities and threats that require local decisions to address.

Obstacles faced and response taken

The approach is based on recognition that "places have specific geographic, historic, environmental and economic circumstances that help to determine the prospects for growth and the most suitable approach to support the private sector and residents' opportunities" (HM Government, 2010, p. 7). Consequently, the focus is on "giving local areas – councils, communities and businesses – the right tools, incentives, freedoms and responsibility to make their own choices" (idem, p. 8). This includes reform of the further education and skills system, based on delivering "vocational training driven by the choices of learners and employers, rather than by central planning and control" (idem, p. 9).

Considerations for adoption in Sydney

RDA Sydney already recognises its mission to bring together people and information to promote collaborative decision making for the sustainable and just economic development of Sydney, with a focus on employment growth. It has had experience in skills development through its work for the Greater Western Sydney Transport and Logistics Skills Development Taskforce and the Greater Western Sydney Manufacturing and Engineering Skills Development Taskforce. RDA Sydney therefore has features that are similar to what is expected from local enterprise partnerships in England, but currently operating on a relatively small scale.

Further information

The Local Growth White Paper can be downloaded from the website of the Department for Business Innovation & Skills at www.bis.gov.uk/policies/economic-development/local-growth-white-paper. The Department also has a dedicated area of its website on Local Enterprise Partnerships at www.bis.gov.uk/policies/economic-development/leps.

Lindoe Offshore Renewables Centre (Syddanmark, Denmark)

Description of the model

Following an announcement that the Odense Steel Shipyard would close, two municipal governments and the regional government of Syddanmark collaborated to create the Lindoe Forum. The Forum

identified offshore renewable energy as a promising sector for job creation, based on an analysis of expanding European investment in this sector and the physical and human assets available at Lindoe.

Against that background, the Lindoe Offshore Renewables Centre (LORC) was established as a commercial foundation in October 2009 by six large companies involved in offshore energy (A.P. Møller - Mærsk, DONG Energy, Siemens Wind Power, Vattenfall Vindkraft, Wave Star and Vestas Offshore) and the University Of Southern Denmark. It aims to be Europe's number one centre for testing, demonstrations and research into technology harvesting renewable energy offshore. Its facilities at the existing shipyard at Lindoe in Odense, Denmark, were officially opened by the Danish Prime Minister on 8 September 2010.

The work of LORC includes a 'green offshore education' project, undertaken in collaboration with the Danish Metalworkers' Union, the Danish Society of Engineers, SDE College (Syddansk Erhvervsskole, formed by the merger of two technical colleges in 2008) and the University of South Denmark. The education project is based on identifying competencies sought after by the Danish green offshore sector, mapping the competencies available in the local Lindoe workforce and finding ways for new retraining and education activities to "fill the gap" and so assist businesses in the sector to grow.

Relevance to Sydney

The LORC foundation is an example of how a locality can develop physical and human assets into a world-class facility offering production, research and training opportunities in an emerging technology for sustainability. In the Lindoe example, the impetus came from the closure of the Odense Steel Shipyard, which meant that the region might qualify for financial assistance from the European Globalisation Adjustment Fund. Even in the absence of such an adverse shock, however, the Lindoe example represents an invitation to stakeholders in Sydney to investigate whether it has any similar opportunity based on the presence in Sydney of large technology-based enterprises, internationally renowned universities, a highly developed TAFE system of skills training and strongly supportive policies by state-level and local governments.

Results of the approach

LORC has set up its governance structure with a Board chaired by former Prime Minister of Denmark, Poul Nyrup Rasmussen, and an advisory Council chaired by former EU Commissioner, Mariann Fischer Boel. It has begun a work programme, including a project to design and build what will be the world's largest and smartest nacelle test bench for wind turbines up to 10MW. It has established the Lindoe Welding Centre, which aims to develop welding techniques that will reduce the cost of manufacturing the foundations and basic structures of wind turbines. LORC offered its first training course (a four week introduction to offshore technology) as a pilot project in March 2011. This course was aimed at former employees from the Odense Steel Shipyard, and was run in cooperation with the Odense Jobcentre. LORC has launched a new magazine, *Oceanwise*, and published its first issue (http://flipflashpages.uniflip.com/2/1112/87730/pub/index.html). This is supplemented with monthly newsletters on developments at the Centre. It has created a web-based knowledge centre, LORC Knowledge (www.lorc.dk/Knowledge) that includes a database on the world's 53 currently registered offshore wind farms.

Reasons for success

It is too early to say that the Lindoe Offshore Renewable Centre has succeeded, particularly in the field of skills training. A report by the European Centre for the Development of Vocational Training and the International Labour Office notes that there is a similar centre in southern Denmark, which could create tensions for jobs (CEDEFOP/ILO, 2010, p. 51). The reason for its attraction as a learning model for other

countries is that its ambitions are not limited to regional or even national leadership; it aims to draw on local resources to create a European centre of excellence in offshore renewable energy.

Obstacles faced and response taken

The initial challenge was to address the consequences arising from the announcement that the Odense Steel Shipyard will close by February 2012. This will lead to a large loss of skilled and unskilled jobs, and have ramifications for firms supplying goods and services to the shipyard. The loss of incomes would be expected to have further multiplied effects throughout the region. Local governments responded to the announcement by setting up the Lindoe Forum, which identified a potential opportunity for the region to develop a European centre of excellence in offshore renewable energy. This could take advantage of the skills in the existing workforce (with some retraining) and contribute to regional economic development. Public funds have been used to initiate the Centre, but its work programme is developed by collaboration with industry leaders who make up its Board.

Considerations for adoption in Sydney

As part of its *Sustainable Sydney 2030* vision, the City of Sydney already aims to "be internationally recognised as an environmental leader with outstanding environmental performance and new 'green' industries driving economic growth". As part of this vision, the City is committed to reducing greenhouse gas emissions by 70 % over the next 20 years (based on 2006 levels) achieved in part by producing 70 % of its energy needs locally from trigeneration plants.

The Lindoe Offshore Renewable Centre example invites Sydney stakeholders to consider whether it is possible to *leverage* the work already underway under the *Sustainable Sydney 2030* vision to achieve international leadership in a particular technology or groups of technologies, supported by mutually reinforcing strengths in Sydney's enterprises, research institutions (including the universities) and public and private training providers. The leadership for such an initiative would need to come from the business community with the support of local and State governments.

Further information

The Lindoe Offshore Renewables Centre has its own website at www.lorc.dk. Andersen (2010) is an article on the establishment of the centre, including an interview with the founding chairman, Poul Nyrup Rasmussen. There are several references to the Lindoe initiatives in the European synthesis report on *Skills for Green Jobs* commissioned by the European Centre for the Development of Vocational Training and the International Labour Office (CEDEFOP/ILO, 2010). The Lindoe Forum website is www.lindoeforum.dk/.

Education Employment Linkages Research Programme (New Zealand)

Description of the model

The Foundation of Research Science and Technology (FRST) was a New Zealand Crown agency responsible for investing approximately NZD 450 million of public money per annum in science and technology research for the benefit of New Zealand.[146] In March 2007, FRST announced that it had accepted a proposal under its Building an Inclusive Society portfolio for a five year research programme on successful education employment matching for young people in New Zealand. The Education Employment Linkages (EEL) research programme commenced on 1 July 2007.

The research question addressed in the EEL programme is: How can formal support systems best help young New Zealanders make good education employment linkages to benefit themselves, their communities, and the national economy? The research team is focusing on four major components of the

overall system; systems operating in school-communities; organisations working in regional communities; initiatives developed by Māori and Pacific communities; and channels led by employers (including systems operating in tertiary education institutions). Research reports on these four components have been published on the EEL website (see below); final integrating reports are scheduled to be released in September 2012.

Relevance to Sydney

Figure 13 in this report highlights individual abilities as a foundation for a successful skill ecosystem. These abilities are discovered and disciplined through education, so it is important that education systems help young people prepare themselves for new opportunities being created in the green economy. The report has quoted international studies, for example, that emphasise the value of core capabilities in science, technology, engineering and mathematics (STEM). In Sydney, the NSW Department of Education & Training recognises the significance of sustainability education. It manages a government-funded support programme to help schools integrate environmental learning and awareness into all aspects of their activities (Sustainable Schools NSW; see www.sustainableschools.nsw.edu.au). The Department declared 2010 as a 'Year of Learning for Sustainability'.

The ethos of the EEL research programme fits into this framework very well. It emphasises the importance of designing and implementing effective systems for helping young people make good linkages between their education choices and their potential employment options. This ranges from creating opportunities for stimulating a young person's imagination on different career possibilities to providing specific guidance about the importance of STEM studies for opening up careers in the new green economy. Good linkages of this type are influential in motivating learning in schools and contribute to producing school leavers who have the skills needed by industry for employment growth.

Results of the approach

The EEL research programme builds on work done within the OECD (2004a, 2004b, 2006) that recognised a fundamental change of policy approaches towards career guidance. Previously there was a tendency for career guidance to be implemented as an education policy targeted at young people at risk of disengagement; it is increasingly being treated as an essential part of labour market policy, intended for all citizens. A study of career education networks and communities of practice in the New Zealand secondary school system describes the core issue as follows (Vaughan and O'Neil, 2010, p. iii).

School-based careers advisors have been given a key role in assisting young people in the transition from school to work and further education. Their role is especially significant in light of the strategic importance attached to career development for workforce preparation and development policies. However major changes in the nature of work and in contemporary transitions from school, as well as shifts in career education theory and delivery, mean that careers advisors are often left playing a continual "catch up" challenge in terms of knowledge and expertise. Meeting the needs of young people today now involves establishing a far wider range of working relationships inside and outside of the school and managing far larger volumes of constantly changing information than ever before.

The report describes how some careers advisors are addressing these challenges by forming dynamic, cross-linking networks alongside and outside of existing organisational structures (idem, p. iii). It is suggested that the selection and training of careers staff needs to take account of new network and community membership and to enhance individuals' capacity to engage in networking. It is also suggested that networks and networking be recognised and valued as a professional activity. Networks can be further developed as communities of practice, perhaps with the assistance of a "professional spine" to give cohesion to what is a diffuse set of ideas, activities, and actors in a very dynamic environment.

Reasons for success

The final reports from the EEL programme are not due until September 2012, but the research is already attracting attention within New Zealand. One reason is that practitioners and policy advisors recognise that its topic is a critical issue for the country's economic development (see the following subsection). Another reason is that the multi-disciplinary EEL research team has adopted a broad perspective on the issue, rather than focusing on just one component of the system to the exclusion of other parts. A third reason is that the research has been framed by a rich international literature, which the research team has been able to apply to the New Zealand situation (see Higgins *et al*, 2008).

Obstacles faced and response taken

A number of researchers and policy advisers have recognised that some young people in New Zealand experience serious difficulties during their transition years from secondary school to full-time employment (see, for example, OECD, 2008). Like many countries, a critical issue in New Zealand is the large number of young people who become disengaged from education, some of whom spend extended periods not in employment, education or training (NEET; see, for example, Department of Labour, 2009, Chapter 5). This is seen as a drag on economic development both because NEET youth represent a waste of human resources and because disengagement from education at an early age is associated with social exclusion and long-term welfare dependency. In recent years, successive governments have offered a range of policy programmes aimed at addressing this issue.

The Education Employment Linkages research programme emphasises one aspect of the overall solution, based on designing effective systems to help young people make good education employment linkages. The research recognises that schools play an important role in helping young people (especially through career education, career guidance and the mentoring of individual teachers) but that there are also systems of support operating in the wider community beyond school. Consequently it has placed considerable emphasis on the way in which networking can be valuable in joining together different systems both inside and outside of the school environment.

Considerations for adoption in Sydney

The Careers Advisers Association of NSW has published a framework for career education in New South Wales schools (CAANSW, 2008). This framework is fully consistent with the results of the EEL research programme in New Zealand; it recognises, for example, the importance of information networks, as well as the essential nature of professional development, to update information on industry changes and post-school courses of study and training and to expand knowledge on new, relevant technology. Thus members of CAANSW are natural allies for disseminating knowledge to young people about emerging opportunities and requirements for participation in the green economy.

Further information

The Education Employment Linkages research programme has a dedicated website at www.eel.org.nz. The science leader for the project is the author of Chapter 3, who can be contacted at Paul.Dalziel@lincoln.ac.nz. The research focusing on school communities is led by Dr Karen Vaughan in the New Zealand Centre for Educational Research (NZCER; www.nzcer.org.nz). The website of the Careers Advisers Association of NSW can be found at www.caa.nsw.edu.au.

CleanTECH (San Diego, USA)

Description of the model

CleanTECH San Diego is a non-profit, membership organisation formed to accelerate San Diego as a world leader in cleantech. Its mission is to "stimulate innovation and advance the adoption of clean technologies and sustainable industry practices for the economic, environmental and social benefit of the greater San Diego region." CleanTECH San Diego is a collaborative of business and financial leaders, academic and research institutes and government and non-profit organisations.

It pursues its mission through a five-part strategy:

1. **Brand:** Establish San Diego as a world destination for all things cleantech. Attract green jobs, green talent and green money to the region while exporting its green products throughout the world.

2. **Policy:** Work with regional, state and federal policy makers to adopt rules supporting clean technology innovation and commercialisation. Focus on products, services and solutions that are particularly effective in the American Southwest.

3. **Innovation:** Work to bring clean technology research efforts to the region; coordinate with established research facilities to identify both synergies and gaps.

4. **Capital:** Bring additional private capital, both strategic and financial to the region. Position San Diego as a major source of quality deal flow among green investors.

5. **Connective Tissue:** Serve as a hub for the many but disparate stakeholders in the clean energy community.

CleanTECH San Diego provides a suite of programmes in the areas of biofuels, capital formation, energy efficiency, smart grid, solar power, sustainable communities, and transportation. It is particularly effective at supporting commercialisation and early-stage formation of companies spinning off from research occurring at the University of California at San Diego (UCSD), the Scripps Institution of Oceanography and the 80 other research institutions in the region. Just a few examples below give some sense of the diversity, breadth and depth of its programmes:

- CleanTECH San Diego formed a Biofuels Initiative that brought together private sector actors, policy makers and elected officials to discuss challenges and opportunities in building an algae biofuels industry in San Diego.

- In the area of capital formation, its SCRUB programme provides early-stage clean tech companies an opportunity to present their business case to CleanTECH San Diego's Capital Formation Committee for capital advice and connections. CleanTECH San Diego then provides these companies with services, regulatory contacts at the local, state and federal level and advice on potential grant resources. It promotes general networking and partnerships among members to support early-stage companies.

- CleanTECH San Diego's solar initiatives aim to attract federal funding, equip municipalities and other government agencies to install solar technologies, demonstrate and showcase new proven solar technologies, and stimulate the uptake of solar technologies through creative financing mechanisms.

CleanTECH San Diego boasts 767 cleantech companies located in San Diego. It sponsored or co-sponsored over 80 networking events in 2010 and was listed as one of the top 10 cleantech cluster organisations in the same year by Atlanta-based Sustainable World Capital's list of global cleantech organisation leaders. Of its USD 1 million annual budget, 60% is generated by member revenues, 40% by grants and contracts, and 10% through miscellaneous sources such as events.

Relevance of the approach

CleanTECH San Diego is the type of organisation that major stakeholders in the Sydney metro area may want to form in order to accelerate green business formation, leverage the intellectual property of research institutions and universities for commercialisation, promote networking and enhance Sydney's identity as a green growth leader.

Results of the approach

- CleanTECH San Diego led a region-wide partnership to secure USD 150 million in Clean Renewable Energy Bonds (CREBs) for the greater San Diego Region. These CREBs can be used by municipalities, school districts, universities and other public agencies to finance solar rooftop installations on public buildings.

- It has steadily grown its membership since its founding in 2007 and has maintained a base that is well-balanced among academic, energy, government, business and finance, and international members.

- It successfully competed for a USD 4 million federal Department of Labour grant for the EDGE (Educating and Developing Workers for the Green Economy) Initiative, which will address the workforce and training needs of the growing biofuels industry in the region, while creating opportunities for unemployed and dislocated workers. The EDGE Initiative is notable because it is an industry-led collaborative effort that will provide education, training, certification and placement services for an emerging cleantech industry for which San Diego has a competitive advantage given its coastal location, the presence of the Scripps Institution of Oceanography and the San Diego Centre for Algae Biotechnology.

Reasons for success

Two main factors account for CleanTECH San Diego's success. First, it benefits from the extraordinarily collaborative and cooperative culture in San Diego. This is a city of inveterate networkers and habitual collaborators. San Diego has long fostered a culture of cooperation between business and government around economic development. Moreover, its business community has a pattern of coming together around regional initiatives. For example, CleanTECH San Diego was able to draw on top-notch pro bono legal services from its member Latham & Watkins in preparing its successful bid to draw in one in every five dollars of CREBs capacity available nationally.

Second, CleanTECH San Diego benefits from fluid relationships among its 80+ research institutes and the business community. It enjoys a robust research community that is geographically clustered. San Diego is also particularly adept at promoting commercialisation of research generated in its region. UCSD formed CONNECT in 1985 to increase commercialisation of research in San Diego and stimulate economic growth in the region. Its success led to the founding of Global CONNECT in 2003 and a proliferation of sister organisations across the world. CleanTECH San Diego is merely the latest in a well-established model of supporting businesses spinning off from the region's academic and research institutions.

Obstacles faced and responses taken

CleanTECH San Diego faces a significant obstacle in a lack of private capital providers in the San Diego region, particularly venture capital. It does not have a robust financial community or any bank or major financial institutions headquartered in the region.

It has responded by working with the City of San Diego to form a cleantech incubator in order to attract the attention of venture capitalists. It has also turned to its major corporations and utilities for strategic investments and acquisitions, such as ExxonMobil, Monsanto and General Atomics. It is also exploring the potential of enlisting credit unions to put up funds for a loan loss reserve for residential energy efficiency programmes in order to spur additional activity in the green building sector.

Considerations for adoption in Sydney

Sydney appears to have a critical mass of university and research institutes, which it can leverage for commercialisation opportunities in a manner similar to San Diego. Both cities have strong manufacturing bases that can also support new green growth. While San Diego lacks private capital, Sydney is the nation's financial capital. The formation of an organisation like CleanTECH San Diego may be the key to harnessing, connecting and networking Sydney's intellectual, manufacturing and financial resources for green growth.

Further information

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The Pecan Street Project (Austin, Texas)

Description of the model

The Pecan Street Project is a research and development organisation focused on developing and testing advanced technology, business models and customer behaviour surrounding advanced energy management systems. It aims to accelerate the installation and management of smarter and cleaner energy services and, in the process, make Austin a leader in smart grid technology.

The initiative began in 2008 as a collaborative effort among the City of Austin, Austin Energy, the University of Texas, the Austin Technology Incubator, the Greater Austin Chamber of Commerce and the Environmental Defense Fund. It was spearheaded by an Austin City Council member who went on to become the organisation's Executive Director. The Pecan Street Project enlisted the participation of nearly a dozen private companies to explore the technical, economic and policy implications of an energy system that relies on better energy efficiency, locally generated renewable energy and a new economic model for electricity utilities.

The project has seven guiding principles:

1) Environmental Protection
2) Replicability
3) Economic Development
4) Economic Stability of the City and Austin Energy
5) Interdependence of Renewable Energy and Energy Efficiency

6)   Scope of Community Integration
7)   Collaborative Process

The project is headquartered at the University of Texas, from which it received its seed funding. In addition to a USD 10.4 million grant it administers (see below), the Pecan Street project has received USD 350,000 for a two-year grant from the Capital Area Council of Governments and other funding from the Doris Duke Charitable Trust. The project does not receive any financial support from the City of Austin.

Relevance to Sydney

The Pecan Street Project is an example of a collaborative project among a city, municipally owned electric utility, university, business and environmental organisation around a discrete green sector issue identified as a potential area of economic growth for the city. This learning model may have lessons for Sydney in how to leverage its own publicly owned utilities for broader green growth purposes.

Results of the approach

The Pecan Street Project issued a report in March 2010 that recommended the steps that Central Texas should take to lead in the creation of a strong renewable energy economy.

Out of this report the Pecan Street Project successfully coordinated an application for USD 10.4 million of U.S. Department of Energy stimulus funding for a smart grid demonstration in the Mueller community. Over the next five years, the following systems will be tested in 1,000 residences and 75 businesses in Mueller:

- distributed clean energy
- energy storage technologies
- smart grid water and smart grid irrigation systems
- smart appliances
- plug-in electric vehicles
- advanced meters and home energy management systems
- green building
- new electricity pricing models

The Pecan Street Project has garnered the region significant national attention, even before the first test system has been put in place. Its public relations team has been very effective at positioning the project, its executive director and the region as thought leaders in the smart grid arena.

Reasons for success

The Pecan Street Project's success is rooted in its founding by an influential and visionary elected official. As a sitting Austin City Council member, Brewster McCracken was able to rally key players around the idea of positioning Austin as a smart grid leader. In particular, he was able to call upon Austin Energy, the city's municipally owned utility, to participate in the effort and act as a test laboratory for the technologies and business processes being explored. Another reason for the project's success is that it is an explicitly collaborative effort that is most closely associated with the University of Texas and the Austin Technology Incubator, rather than the City of Austin.

Obstacles faced and responses taken

The Pecan Street Project avoided the single biggest potential obstacle in its path by not allowing itself to be a project driven by Austin Energy or any other utility with a stake in the existing business model. This gives it greater credibility and independence than it might otherwise have as a City or utility project. This enabled the researchers and analysts involved in crafting the March 2010 report to squarely address the inherent threat to the existing utility business model posed by energy efficiency, demand management and distributed renewable energy projects.

Considerations for adoption in Sydney

A demonstration project of this type might complement the new model green communities being developed by LANDCOM. Lessons learned from deploying smart grid technology in a demonstration project could also inform the next generation of BASIX standards. The Pecan Street Project might also serve as a useful model for drawing Energy Australia into a collaborative effort aimed at economic development in the energy sector. A key element for success may be the involvement of a dynamic, compelling elected or public official with a deep commitment to fulfilling Sydney's potential as a green growth leader.

Further information

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Regional Growth Strategy (Vancouver, Canada)

Description of the model

Metro Vancouver is a nonpartisan political body operating under provincial legislation on behalf of 22 member municipalities and one electoral area with a combined population of 2.1 million. Metro Vancouver is governed by three Boards of Directors drawn from elected officials appointed by their respective municipal councils. The number of directors appointed from each municipality relates to the population. The formula is one vote for every 20,000 people, up to a maximum of five votes.

Metro Vancouver carries out three primary roles: service delivery, planning, and political leadership. Metro Vancouver provides drinking water, sewerage and drainage, and solid waste management to municipalities, and provides regional parks and affordable housing directly to the public.

Metro Vancouver has three main areas of planning and regulatory responsibility: regional growth (land use through municipalities and transportation through TransLink); waste management (solid and liquid waste) and air quality management (a delegated Provincial function).

Metro Vancouver also serves as the main political forum for discussion of significant community issues at the regional level. It acts as a facilitator, convenor, partner, advocate and a significant instrument for providing information and education to the community.

Metro Vancouver is required, under provincial legislation, to prepare a regional growth management strategy in collaboration with its member municipalities. The legislation requires unanimous acceptance by all local authorities affected by the strategy, including neighbouring regional districts and Translink. In the event unanimity is not reached, the enabling provincial legislation lays out a series of dispute resolution options.

Within two years of the Metro Vancouver Board's adoption of the Regional Growth Strategy (RGS), each municipality must submit to the Metro Vancouver Board a Regional Context Statement that identifies how the municipality's Official Community Plan relates to the goals, strategies and actions identified in the RGS and, if applicable, how the Official Community Plan will be made consistent with the RGS over time.

Relevance to Sydney

Metro Vancouver's structure and the process for adopting an RGS provide a model of enforceable, integrated regional planning that provides local governments a direct voice in the crafting of the overall land use and infrastructure framework that drives development in the region. The approach provides Sydney with a good example of shared governance around planning and infrastructure.

Results of the approach

In January 2011, the Metro Vancouver Board of Directors asked local governments to approve a new RGS, titled Metro Vancouver 2040: Shaping Our Future. This 73-page document summarises the roles of Metro Vancouver, its member municipalities, and the role other governments and agencies will need to play to achieve five major goals:

GOAL 1 - Create a Compact Urban Area
GOAL 2 - Support a Sustainable Economy
GOAL 3 - Protect the Environment and Respond to Climate Change Impacts
GOAL 4 - Develop Complete Communities
GOAL 5 - Support Sustainable Transportation Choices

The RGS was developed out of a consultation process that began in November 2007 and engaged residents, the business community, and member municipalities. Metro Vancouver hosted 46 public meetings. Its staff held 38 meetings with municipal councils and participated in many other discussions and presentations with a wide range of stakeholders. Almost 2,000 members of the public attended the meetings.

Obstacles faced and responses taken

On April 8, 2011, despite intensive efforts to accommodate its concerns, the City of Coquitlam declined to approve the RGS. As a result, adoption of the RGS will be significantly delayed, despite the approval by 23 of 24 involved local authorities. Coquitlam's rejection of the RGS triggered a provincially mandated dispute resolution process that could take months to complete. Metro Vancouver has asked the provincial government to expedite the dispute resolution process by proceeding to binding resolution, rather than the initial non-binding process set forth in the provincial law.

Considerations for adoption in Sydney

The standoff with Coquitlam illustrates the downside of more inclusive approaches to regional planning. However, approval by the 23 other local authorities for a regional plan rooted in sustainability principles is heartening. Wholesale importation of governance models from other countries and political cultures is unrealistic, but given the failure to invest in necessary infrastructure to keep pace with Sydney's growth under the current governance system, in the long-term, Sydney's LGAs may wish to advocate for a reform of Australia's "whole of government" system to give local governments a bigger voice in regional planning and infrastructure decisions. In the short-term, Sydney's LGAs might review Vancouver's Regional Growth Strategy as a good example of a plan with cascading goals and clear performance metrics against which to measure progress.

Further information

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http://www.metrovancouver.org/planning/development/strategy/Pages/default.aspx

ENDNOTES

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69 TAFE is the original acronym for Australia's system of "technical and further education" created in the 1970s. TAFE Institutes are government owned, delivering training and education programmes financed by a combination of State and Federal funds.

70 The numbers in brackets are enrolments in 2008 drawn from NSW DET, 2008

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Climate Change, Employment and Local Development in Sydney, Australia

This report presents the analysis and key findings of the project on Climate Change, Employment and Local Development in Sydney, Australia, carried out by the Local Economic and Employment Development (LEED) Committee of the Organisation for Economic Co-operation and Development (OECD).

Sydney and its main organisations are undergoing an important transformation in terms of the approach to human capital development, growth and job creation, and integrating the sustainability component into the greater metropolitan Sydney strategy and actions. Sydney is leading a wave of transformation in the country and has some state-of-the-art initiatives that are examples to other OECD regions. However, a challenge remains with respect to the governance of the system and the adjustment of programmes to the new needs of a low-carbon economy.

This report analyses the challenges and opportunities of Sydney in this context, and provides some policy recommendations on how the public authorities and other key agencies could best support the emergence of a green economy – making the best use of the skills available while creating wealth and growth.