GREEN JOBS: POTENTIAL IN THE AUCKLAND REGION

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Abstract

The move to a more sustainable economy requires us to rethink how our current economy and society operates within a dynamic environmental and cultural setting. The concept of 'green jobs' is a relatively new means of classifying jobs with environmentally beneficial outcomes, and a methodology was developed under a joint project of the United Nations Environment Programme, International Labour Organisation and International Trade Union Confederate in 2008 to measure green jobs. Employment indicators show the type of activities within an economy, they link industry and businesses to communities and individuals. Tracking employment shifts across industries and sectors reveal structural changes in an economy's composition. Tracing business and workers' practices within those industries reveal changes in behaviour – toward more sustainable practices or otherwise. This paper explores the concept of green jobs and its relevance to the Auckland labour market. It measures the number of green jobs in the Auckland region, using a regional input-output model of the Auckland economy. This is the first attempt in using this methodology to quantify green jobs.

Introduction

Job creation in sustainable industries and businesses is increasingly attracting attention. An essential concept in all definitions of sustainability is that our current collective actions and planning should not compromise the ability of future generations to meet their needs. As a concept, sustainability has been mainstreamed in business awareness. Sustainable employment and sustaining the labour force is a concern of industry (Reid, 2008). The term 'green collar worker' emerged in the 1990s, to describe individuals working on environmental issues, as a corollary to the terms 'blue' and 'white' collar workers. Such broad categorisations are evocative, but are not specific enough for an analysis of employment sectors. The term 'green jobs' emerged to describe occupations and work which enhance or improve the environment. Its definition can create a complex methodological debate, not least because there are varying degrees to which environmental improvements can be made, and therefore varying intensities or shades of green. However, it is a welcome inclusion to the literature on sustainability, as it integrates a social dimension – in particular the implications for employment and work. Recent research undertakenwithin the United Nations, International Labour Organisation and International Trade Union Confederation (UN/ILO/ITUC, 2008) aimed to clarify the concept of green jobs, focusing on 'positions in agriculture, manufacturing, research and development, administration and service activities aimed at alleviating the myriad of environmental threats faced by humanity'. This includes jobs that protect and restore ecosystems and biodiversity, reduce energy, materials and water consumption through efficiency measures, jobs that de-carbonise the economy and minimise forms of waste and pollution. Other definitions of green jobs qualify the sustainability of the job itself – incorporating an element of human satisfaction for the job (Canadian Labour Congress, 2003). It is recognised that certain green jobs are not necessarily desirable and can be dangerous if sufficient health and safety standards are not in place – such as recycling dangerous substances, or remediation of heavily polluted sites. The UN/ILO/ITUC (2007) qualifies the definition of green jobs by stating that they need to be 'decent' work – that is offering decent wages, safe working conditions, job security, reasonable career prospects and worker rights. A job that is exploitative, harmful, fails to pay a living wage and therefore leaves the worker in abject poverty is not considered green.

These broader objectives of green jobs are aligned to the aspirations set out in the Auckland Sustainability Framework (ASF) (Auckland Regional Growth Forum, 2007), which outlines a long-term vision for the region. The ASF aims to secure quality of life and create a sustainable future socially, culturally, economically and environmentally. Of particular relevance to green jobs are the aspirations of 'creating prosperity based on sustainable practices'; 'having a fair and connected society'; 'creating prosperity through innovation'; and 'putting people at the centre of thinking and action' within the ASF. Employment indicators are important for monitoring changes within industries. Specifically

focusing on green jobs enables the integration of the economic, social and environmental components of the labour market. In a move toward a sustainable society, no doubt there will be displacement effects in employment, as technological practice becomes outdated. Some jobs will be substituted to new technologies, especially in manufacturing or for example from land filling to recycling. Certain jobs will be eliminated when technology is deemed inappropriate. Many jobs will be transformed and redefined, as work methods and processes become more sustainable or greener.

But how should the environmental impact of an individual job be evaluated? In the early years of environmental debate, there was a trade-off identified between 'jobs versus environment'. This trade off has been investigated, showing that the converse is true (Rennings *et al*, 2001). Symbiosis between society, the environment, culture and the economy sustains a workforce. When looking specifically at sustainability principles and their effects on the labour market, certain factors merit consideration, or different levels of analysis should be distinguished. On an individual level, the self-assessment of the worker/employee's behaviour can reveal 'greening' of workplaces – employees may consider themselves as environmental champions in their workplace ethics, for example travel to work, recycling practices, energy and waste conservation. On a business or firm level, behaviour encouraging and allowing sustainability can be gauged, for example working from home and allowing flexible work hours.

What is increasingly common in an approach to green jobs is the move away from focusing on environmental remediation and pollution control to an emphasis on potential and environmental opportunity. Certain jobs are easily identifiable as 'green', such as working in pollution management, sustainable forestry or organic farming. Others are more difficult to detect. On an industry level there can be strategic shifts toward green technologies, for example eco-innovations and design changes to end products which have beneficial environmental outcomes. The production of these products may require inputs from traditional processes/manufacturing such as the production of aluminium for windmills. A worker within an aluminium smelter may not consider their work 'green' or environment enhancing, although the use of the end product can have good environmental outcomes. Therefore place within the supply chain is important, as are service jobs which may not exclusively service the green sector.

These are examples of indirect green jobs, and the methodology used in this paper attempts to quantify these for the Auckland region. Green jobs require different levels of skills, education backgrounds and occupations. This paper combines a review of previous research into Auckland's green sector; industry interviews and observations undertaken in 2008, as part of the Auckland Region's Economic Futures Project; and modelling the green sector in an input-output model for the Auckland region, to quantify the number of green jobs. The following section provides further background information on some of the drivers of green jobs in New Zealand.

Drivers of Green Jobs

There are different drivers associated with green jobs. The state/regulatory framework is a significant driver in New Zealand and government considerably affects the green sector, and green industry. Markets and consumer preferences as drivers are also discussed here.

The state acts as a driver for green jobs, with the expansion of government led environmental industries and jobs associated with environmental monitoring. The aim of improving the domestic environment, adhering to international conventions, and multilateral approaches to global environmental problems are the overarching policies which result in green job creation. In New Zealand, the most significant environmental legislation includes: the Environment Act 1986, the Resource Management Act 1991 to promote the sustainable management of natural and physical resources; the Hazardous Substances and New Organisms Act 1996; the Energy Efficiency and Conservation Act 2000; the Climate Change Response Act 2002, legislating for Kyoto Protocol obligations; the Resource Management Consolidated Regulations of 2003 and 2005 which specify air quality targets and limits to particle emissions and pollutants; the Climate Change Response (Emissions Trading) Amendment Act 2008 and the Electricity (Renewable Preference) Amendment Act 2008, establishing the 10 year restriction on thermal electricity generation. The New Zealand Transport Strategy 2008 outlines a series of high-level transport targets, the principal being per capita emissions for domestic transport to be halved by 2040. The government is developing national standards (in addition to the air quality and drinking water standards) on: water takes; ecological flows and takes; telecommunication provision and electricity transmission; wastewater systems and contaminated land. A proposed national policy statement on renewable energy generation was also released in August 2008 which set out its policy tool to achieve the target of 90% renewable power by 2025, as outlined in the New Zealand Energy Strategy to 2050.

This raft of legislation has resulted in economic activity to: improve energy efficient buildings; improve air quality; explore energy supply alternatives; while also changing manufacturing and production processes. Regional and local government are active in implementing the Resource Management Act, while also employing a range of green jobs associated with environmental enhancement. Certain industry sectors, such as waste management are affected through information campaigns and guidelines for implementing recycling systems.

With respect to new technologies and eco-innovation, a characteristic of the New Zealand economy is that overall it is a technology taker rather than a technology creator (OECD, 2007). Therefore much of the advanced technology is imported and a driver of green activities come from overseas through our imported products. Some exceptions are evident, and certain areas have been targeted by the government for development, such as agricultural R&D, advanced materials and the marine sector where there is potential to be a world leader in technological advancements and eco-innovation. How the market reacts to greening such technologies and incorporating sustainability principles into its processes are areas to target for green jobs.

Within markets, investment decisions are increasingly taken on environmental grounds, and influenced by environmental marketing (Jones, 2008). Consumers are increasingly demanding environmental standards and accountability in the products they buy. Sustainability principles are becoming mainstreamed, and influenced by information campaigns. Trends in international consumer preferences affect Auckland and New Zealand businesses, particularly in the food and beverage production sector. Within the labour market itself, workers can also choose the type of employer and activities that their labour is used for. Therefore individual preferences can shape the labour market, and activities in the labour market.

A significant departure in recent years has been the realisation that instituted sustainable practices can be used as an effective marketing tool, used as a selling point for the overall quality of a product. Thus, business can capture market share, using their sustainable and green practices as a point of difference from competitors. Advertising and marketing play a role as a driver for the green economy.

The market through price mechanisms also drives the demand for clean technology – in particular energy, given the inevitability of peak oil and the general increase in the price of electricity generation.

Identifying Green Jobs

The UN/ILO/ITUC (2008) report outlines six particular areas where there has been an emergence of green jobs. These are: energy supply; transport; buildings; basic industry and recycling; food and agriculture; and forestry. This section discusses each of the six in light of the Auckland regional economy.

Globally there has been a surge in research and activity for finding energy supply alternatives to carbon-based fuels. This relates to the use of renewable energy sources - wind, solar, hydro, geothermal and biomass – although the negative aspects of first generation bio-fuels is acknowledged. Carbon capture and storage is another potential sector of a green economy, although the scale of technology may not be sufficient to allay carbon induced climate change. There has been an estimated six-fold increase in investment in renewable energy in the last ten years world wide. By international standards, New Zealand has a high proportion (approximately 70%) of its electricity generated by renewable energy sources, mainly hydro power. The New Zealand Energy Efficiency and Conservation Authority (2007) identified the potential within the Auckland region for an increase in the uptake of solar thermal on a small scale; no significant hydro potential, but some opportunities for mini/micro hydro power schemes; 500mw electricity generation from wind power; ground source heat pumps using geothermal – for domestic and commercial systems; and limited potential for tidal power generation.

Nationally the transport sector consumes more energy than any other sector, representing 42% of New Zealand's total energy use. Land transport (road and rail) represents around 90% of total energy use in the transport sector. A large proportion of land transport energy use occurs in the form of private motor vehicle use. Conventional diesel and petrol continue to be the primary fuel types used in the transport sector. In terms of pollution control, there are opportunities for Auckland to create jobs through continued commitment to a sustainable environment. In particular, transport accounts for 78% of the total mass of all ambient pollutants (excluding carbon dioxide) of Auckland regional air pollution, while 11% is attributed to industry and 11% to domestic sources over an annual period (Metcalfe, Sherman and Kushel, 2006). Restructuring the transport system away from its high polluting current structure has the potential to enhance the environment, as do initiatives to reduce domestic pollution from fuel burning. With transport, there is scope for eco-innovations in terms of both processes (systems design) and products (cleaner technology) – in a switch of use from the high polluting fleet of vehicles to cleaner, smaller more efficient vehicles, while reducing the kilometres travelled and increasing public transport patronage. Growth in jobs in this sector will result in the provision of more sustainable alternatives for vehicle users.

Linked to energy supply, is energy conservation. The Intergovernmental Panel on Climate Change (2007) identifies buildings as having the single largest potential of any sector for the reduction of energy use, and hence greenhouse gases and emissions. Energy efficiency initiatives are considered to have a 'double dividend' in that they are environmentally benign and overall lead to an increase in jobs. Efficiency measures in the building sector include green buildings and retrofitting as well as improving the efficiency of equipment within buildings, such as lighting, electronic and domestic appliances. Different occupations can switch their activity into the green sector without too much displacement - from designers and architects, engineers, surveyors, project managers to the trades associated with construction such

as general construction workers, plumbers, insulators and electricians. In a study of the housing stock of Auckland (Parfitt, 2008), it was found that energy use is not optimised. 57% of Auckland's housing stock was built before the 1978 standard for insulation was first introduced, and it is estimated that between 20-30% of houses in the region have no insulation. This is coupled with some inefficient heating systems, such as domestic fires.

Manufacturing continues to be a major industry in the Auckland region (see figure 1). Innovation in the manufacture of composite materials has led to extending the lifespan of some advanced materials. The marine industry is important to Auckland, and there are numerous examples of innovation in design, which have energy saving implications and thus can be considered eco-innovation. There has been considerable advancement in waste management in recent years in the Auckland region, with a proliferation of domestic recycling schemes, and examples of electricity generation from waste gases. There is still scope to reduce the amount of waste going into landfills, which is annually in excess of one million tonnes. Auckland has national significance in the recycling of paper, plastics and glass in terms of the level of technology in the recycling plants in operation. There is scope for the recovery of tyres, organic waste, used oil and demolition waste (Covec, 2007). It is envisaged that between 200 and 300 jobs could be created if a resource recovery network were established for the Auckland region (Roberts, 2005).

Primary sector industries such as agriculture and forestry are not very prominent in the Auckland region (except for perhaps horticulture). However their significance to the New Zealand economy is well documented, and Auckland provides services for the agricultural and forestry sectors. Given global trends in food shortages, high food prices and the need for food security, businesses need to focus on innovation and raising productivity in an environmentally sustainable way. Herein lies the potential for green jobs relating to bio-technology and innovation. The effects of consumer demand for healthy products with a low carbon footprint are most felt in the food and beverages industries. In terms of land coverage, there is relatively little forestry in the Auckland region, and as such, this sector is of minor importance to the region.

Classifying the Auckland region's Green Sector

This section details the method which was used to specify the proportions of Auckland's economy that make up the green industry. It was coded according to industry classification, and each ANZSIC 96 six digit code was weighted to reflect the proportion of that industry assumed to be involved in the green sector. This reflects either output of the industry or methods employed by that industry sector which were deemed beneficial to the environment. This approach is a first attempt and it is acknowledged the weighting system is subject to incomplete information.

Industries within agriculture and forestry have very different effects on the environment. Some were weighted slightly higher than others (sheep farming, bee-keeping, fruit growing, forestry and forestry services) at 30%. Consuming food grown locally reduces transport costs, but there are environmental costs associated with conventional farming practices. Services to agriculture were weighted at 80%.

For manufacturing, a uniform weight of 1% was given to all types of manufacturing, with the exception of higher weights to certain industries where it was known that significant eco-innovation is occurring (e.g. paint production, or public transport equipment manufacturing). The uniform weight reflects overall environmental improvements that the industry has made, presumably associated with energy efficiency gains.

Electricity, gas and water supply was given a relatively high weighting, not particularly reflecting Auckland specific innovation in this industry, but the national proportion of renewable energy generated. Certain industries cannot be evaluated on a regional level, as the broader national framework determines its engagement with the green economy.

The construction industry in Auckland has been a significant employer in Auckland in recent years. It is a crucial industry for green jobs. A weight of 5% was allocated to most of this industry reflecting energy efficient processes in new building design, the retrofitting of older buildings, and installing technologies such as solar panels and heat pumps as substitutes for open fires.

For wholesale and retail trade a uniform weight of 0.5% was given to reflect changes in practices attributed to the greening of the sectors, with higher weights attributed to second hand trading, increasing the lifespan of products by keeping them out of landfill. Similarly for accommodation cafes and restaurants, a uniform weight of 0.5% was attributed, more so to acknowledge some activity in the green sector rather than none, although not much evidence was collected from this industry sector.

As motor vehicle transport is a considerable pollution source in the Auckland region, industries involved with increasing public transport use were given a high weighting. This reflects the electrification of Auckland's rail network and increasing bus patronage in the region in recent times. Certain industries within business services were considered key to activity within the green economy (weight of 20%), such as scientific research, architectural services, engineering and technical services. Equipment hiring industries were also weighted in consideration of optimisation of capital resources.

Other business services were weighted for their contribution to green activity, including legal services, accounting, market research activities amongst others.

The government administration was given a relatively high rating (15% for central government and 40% for local government), since environmental legislation is a considerable driver of green activities. Local government is responsible for implementing the Resource Management Act and has activities in the management of natural and physical resources.

The post secondary education sectors were attributed 10% weightings reflecting their role in disseminating environmental education. Certain industries within cultural and recreational services were given considerable weights – libraries (40%); zoological and botanical gardens (30%); recreational parks and gardens (50%). Other green industries identified were personal and household hiring services (30%); gardening services (30%); and waste disposal services (100%).

Estimating Auckland's Green Jobs

As discussed previously, within Statistics New Zealand industry classification, there is no formal green sector, or industry clustering of green technology production. This is a data gap in official statistical reporting, but is inevitable for an emerging industry such as the green sector (UN/ILO/ITUC, 2008). After classifying Auckland's green economy using a weighting system described above, this green sector was modelled into the Auckland Region Economic Futures Model (EFM). This model is based on a multi-regional economic input-output table, developed for the Auckland Regional Council by Market Economics Ltd. The EFM is based around a 48-industry categorisation using the six digit ANZSIC 96 classification system.

An input-output table describes inter-industry linkages in an economy for a given period. The EFM is based on the 'generating regional input-output tables' (GRIT) methodological sequence, whereby national input-output technical coefficients are translated to a sub-national or regional level, using Statistics New Zealand's 1995-96 inter-industry study of the New Zealand economy, updated to the 2004 financial year. The model is run using scenarios, and it models the growth path of each scenario, for 48 sectors along with households over 25 years (Auckland Regional Council, 2008). The EFM generates output indicators such as value added by industry and employment by industry and exports from that industry. The employment figures generated are based on the ratio of full time equivalent employees to total output in the base year, derived from the Statistics New Zealand's Business Frame, full time equivalent employees time series. They are adjusted according to an assumed labour productivity rate of 0.64% for the subsequent years (McDonald and Smith, 2008).

The weighted components of industry were inputted into the EFM as an additional 'sector'. The model tracks the inter industry linkages in the Auckland economy. The Auckland region's green sector was estimated as employing 27,691 full time equivalents (FTEs) in 2006. This is out of a total of 601,612 FTEs. Therefore from the classification used in this paper, green jobs comprise 4.6% of the Auckland's total jobs. This makes employment in the green sector comparable with Auckland's biotechnology sector, its digital sector and its information and communication technology sector (while recognising that these categories are not mutually exclusive). The regional domestic product or value added attributed to the green sector was $2,592 million (in 2006 dollars), or 5% of total regional product.

To put the green sector in context, figure 1 shows Auckland's top employers by industry, (based on a breakdown of employment into 48 sectors). Care should be taken when comparing the green sector to these industries, as the green sector cuts across all of these industries. However it is useful to gauge the relative contribution of the green industry to the overall regional economy. Overall business services is the greatest employer, followed by retail and wholesale trade, the construction industry and health and community services. (If all manufacturing were aggregated, this would be the second biggest industry in terms of employment).

From the Economic Futures Model, the occupation of workers in the green sector is estimated, based on the average proportion of these occupations in each industry. These results are presented in Figure 2. Specialist managers had the greatest number of green jobs (2622), followed by educational professionals (1781), business, human resource and marketing professionals (1510), road and rail drivers (1429) and chief executives and general managers (1193). Thus it can be seen that green jobs span many occupations.

Further Research

The EFM projects changes in the sector for the next twenty five years. This shows an annual average growth rate of employment in the green sector at 1.3%. However, this growth rate is deemed inaccurate and too conservative, as the model picks up on past trends over a twenty year period. As the classification system used is a weighted method of existing employment in industry, it is static and does not encompass the emergent growth in the green economy, as the industry did not exist in official reporting. Therefore no trend analysis is available. The model can be modified and qualified for this more dynamic aspect of the green economy, and will be completed as part of a scenario within the Auckland Region Economic Futures Project, and an area of future work to be completed.

The growth in green jobs is likely to increase over the coming decades, and there are particular areas where green jobs are likely to emerge, given existing conditions in the region.

Conclusion

This paper is a first attempt to quantify employment in the green industry in the Auckland region. A methodology was developed, based on a recent publication of the United Nations/International Labour Organisation/ International Trade Union Confederation, which elaborated on the concept of green jobs. A system of weights was attributed to Auckland's ANZSIC 96 industry codes, reflecting engagement of each code (at six digit level) with the green sector. This green sector was created within an input-output model of the Auckland economy, and generated employment figures (full time equivalents) for green jobs. It also classified these jobs according to occupations.

Figure 1: Auckland region's top employment by industry, 2006 (source Auckland Regional Council, 2008)

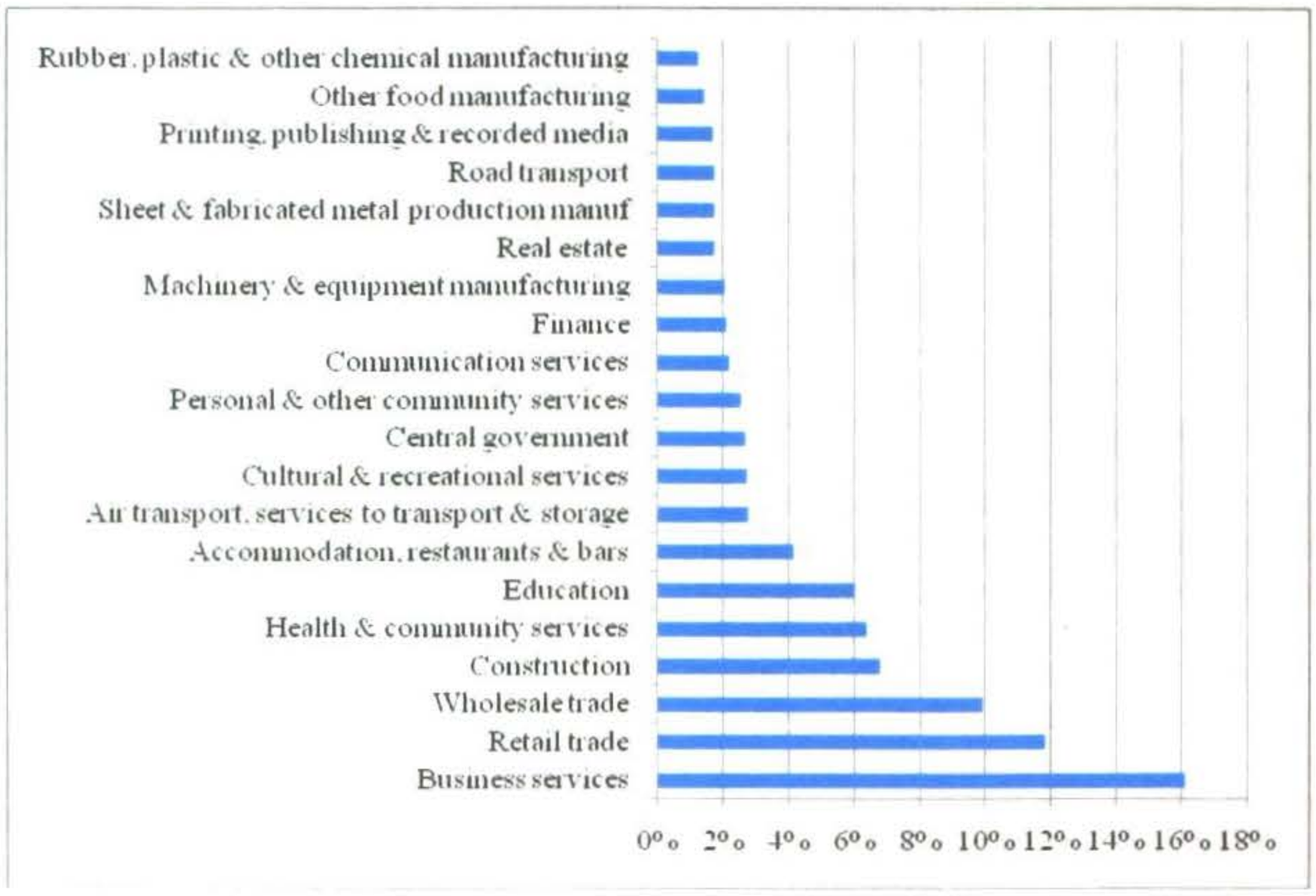

Figure 2: Occupation of Auckland's Green Jobs (source Economic Futures Model)

Green Job Occupation	No. FTE	Green Job Occupation	No. FTE
Specialist Managers	2622	Office managers and programme administrators	530
Educational professionals	1781	Skilled animal and horticultural workers	527
Business, Human Resource and Marketing	1510	Electrotechnology and telecommunications	477
Road and rail drivers	1429	Cleaner and laundry workers	447
Chief Executives, General Managers	1193	Protective service workers	442
Design engineering science	1087	Machine and stationary plant operators	435
Construction trade workers	1031	Inquiry Clerks and receptionists	427
General clerical workers	974	Sports and personal service workers	420
Farm forestry and garden workers	793	Carers and aides	417
Other technical and trade workers	744	Personal assistants and secretaries	412
Other labourers	730	Arts and Media professionals	332
Sales Reps and Agents	699	factory process workers	326
Sales assistants	661	Construction and mining workers	287
Legal socia and welfare professionals	647	Health professionals	281
Engineering ICT and science technicians	640	Mobile plant operators	236
Not Elsewhere included	628	Clerical and office support workers	229
ICT professionals	614	Storeperson	218
Farmers and farm managers	610	Sales support workers	186
Automotive and engineer trades	562	Hospitality workers	177
Numerical clerks	555	Health and welfare support workers	122
Other clerical workers	552	Food trade workers	109
Hospitality Retail and Service Managers	537	Food preparation assistants	55

Acknowledgements

Special thanks is accorded to Garry McDonald of Market Economics and the New Zealand Centre for Ecological Economics for his input to this paper.

Note

1. The opinions expressed in this paper are those of the author, not the Auckland Regional Council.

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