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**A SUMMARY OF METHODS AND APPROACHES FOR
IDENTIFYING THE SKILLS NEEDS ASSOCIATED WITH THE
TRANSITION TO A LOW CARBON ECONOMY AND A
CONSIDERATION OF THE POLICY AND RESEARCH
IMPLICATIONS**

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20th of June 2011

¹ Note: This piece of work was commissioned by the ILO

Why is it important to look at identification of skill needs for the green and low-carbon economy?

The recent financial crisis and the corresponding economic downturn is undoubtedly one of the worst since the great depression of the 1930s. The impact of the downturn on labour markets is not reserved for developed nations, but is also being felt in developing countries. The most immediate impact of the crisis on labour markets can be seen in falling growth rates, cuts in production, consumption and consequently increasing levels of unemployment. The economic downturn affects certain groups more than others. Older workers in the developed world have been severely hit by the falling value of their pension while the most significant impact on jobs occurred in the male dominated sectors, such as construction and finance. This contrast with the situation in Africa and South Asia where the first people to lose their jobs were women employed in the export orientated sectors. Nevertheless, as the economic downturn has spread across the globe the negative impact is felt by most groups, especially women and those in vulnerable forms of employment.

Part of the solution to the current economic crisis has involved stimulous packages, a considerable proportion of which have focused on the environment and attempts to generate more sustainable forms of development, including a move towards a low carbon economy. This has gone hand-in-hand with concerns over how to make development more environmentally sustainable especcally with regard to the introduction of energy saving measures and the use of more sustainable forms of engery. he transition to a low carbon economy involves using current energy sources more efficiently and where possible substituting carbon-emitting forms of energy with more renewable and sustainable forms of energy. However, it should be noted that the ‘greening of an economy’ is a broader concept, which also encompasses other sustainability issues, such as water conservation and prevention, and remediation of pollution.

The move towards a low carbon economy is having a signficiant impact on certain sectors of a country’s economy and on the demand for new types of skills and the changing nature of occupations. Together governments and stakeholders in different parts of the globe are looking for straetgies to respond to the demand for new skills in the transition to a low carbon economy. The failure to capture what new skills are required in the new low carbon economy, develop appropriate strategies for supply, and follow through with implementation, can lead to major obstacles amongst current green stimulus packages and longer term strategies to save engery and promote the use of more sustainble engery forms.

It is against this background that the EC and the ILO have developed a joint program to enhance cooperation and knowledge sharing in the field of early identification of skill needs for the low carbon economy. This will lead to an improved understanding of best practices amongst the two organisations and provide value added to their own activities in this area. So far this cooperation has resulted in the completion of three studies and constitutes the majority of the material upon which this summary is based.

Mapping the terrority

On a theoretical level it is easy to define the nature of skill requirements for a transition to a low carbon economy in terms of the: changing need for exisitng occupations; changing occupations; newly emerging occupations and new skill needs across occupations². However, what is more

² Note for a full defintion of these terms see: ILO and EC (2011) Comparative Analysis of Methods of Identification of Skill Needs on the Labour Market in Transition to the Low Carbon Economy

problematic is understanding how to analyse or map changes in skill requirements on an empirical level. Part of this problem stems from the fact that green jobs are a moving target and difficult to define. In this respect, based on the assumption that every job can become greener, the ILO Green Jobs report has developed the following definition:

“...work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution.”

Euro-Stat has developed a more concrete approach for measuring green jobs. Using a statistical definition Euro-Stat defines that only technologies, goods and services that have been produced for the environment are included in the scope of the environmental sector. Moreover, within this definition environment-related activities are defined as those that “measure, prevent, limit, minimize or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, goods and services that reduce environmental risk and minimize pollution and resource use.”³

Understanding where the so-called green jobs can be found is an even more complex task, involving research and analysis along a number of dimensions. In an ideal world identifying green jobs should involve cross cutting research connecting: macro analysis to sector analysis, sectoral analysis to occupational and skills analysis, and occupational and skills analysis to a consideration of training and education implications and how they can be met. Unfortunately, there are few methodological approaches that address all the former dimensions in a coherent manner. Normally, the focus of the research will depend on what research questions are being asked or on what approach is being implemented. For instance, at the macro level, research questions tend to focus on the overall employment impact of the transition to a low carbon economy. This approach will require the use of macro-economic analysis to explore such issues as the impact of green stimulus spending or, the impact of changes in relative prices arising from taxation of carbon, etc.

Nevertheless, most research questions about the impact of the transition to a low carbon economy require significant analysis at the sector level. Emphasis would need to be given to sector level changes, such as growth in employment in renewable energy industries, the growth of industries providing services and goods for energy efficiency and loss of employment in carbon intensive activities such as coal mining and traditional coal-fired generation of electricity, which are important features of the transition to the low carbon economy.

It should be pointed out that even research focused at the most macro level should take into account the significant effects of sector changes, particularly in terms of quantitative indicators and a qualitative interpretation that is meaningful to macroeconomic analysis. Similarly, sector analysis may also require analysis beyond the sector level to identify wider employment effects through the supply chains of businesses in the sector (indirect employment) and through the wider effects of consumer spending by those employed in businesses in the sector and in their supply chains (induced employment).

³ Eurostat: *The environmental goods and services sector*.

Moving onto the next level, much of the emphasis is on understanding or obtaining signals on what low carbon skills are in demand in specific sectors now, and in the near future. The quantitative methodologies tend to rely on using standard occupational classifications as a proxy to obtain signals on the nature of skills in demand within the sector being analysed. Often this occupational data may be supplemented with a profile on educational levels. Alternatively, qualitative research on a sector level focuses on a highly aggregated group of occupations and disaggregated up to 3 or 4 levels of ISCO coding. However, this research on occupations tends to combine qualitative and quantitative approaches, involving the development of detailed skill profiles that are used as the basis to design new courses or upgrade existing ones.

Despite the differences in the nature of research questions are being addressed, the various methodological approaches attempt to understand how many low carbon jobs are going to be created now and in the future. The more detailed methodological approaches also focus upon how the content of existing occupations are changing and what new occupations are being created in response to the movement towards a low carbon economy.

Methods and data availability

There are number of different quantitative and qualitative approaches that can be used to identify the skill nature or occupational requirements of green jobs, now and in the future. Each of these methods has their advantages and draw-backs. The type of methodology or approach used will depend upon the following: the research question being addressed, the availability of data, the capacity to implement, and the corresponding cost implications of carrying out this activity. In reality researchers use a combination of methods, drawing upon different tools in order to address the short-comings of using a stand-alone approach.

Quantitative Approaches

There are a wide range of quantitative approaches used to explore the impact of a reduction in carbon emissions and policies to support clean energy on general economic performance, but few studies address the skill or occupational implication in coherent manner. Normally, an economic model would generate estimates of employment growth by industrial sector or occupation. Subsequently, these estimates are then paired with information from other sources to describe in much greater detail the character of the job being created, or the job undergoing change.

At the macro-level there are two principal models used to measure green jobs, the input-output models and the computer general equilibrium models. The input-output models attempt to estimate changes in output and employment, sector by sector, caused by a growing demand for goods and services associated with measures or strategies for lowering carbon emissions, such as the growing demand for construction services to modify existing houses as a result of energy-efficient retrofits. The Social Accounting Matrices (or SAMs) are extension of the input-output models that takes into account the public sector, taxes and transfers, and household accounts. For example, a SAM may disaggregate the household sector into categories based on the household income. In this way, the model captures distributive dynamics that cannot be tracked using a basic input-output model.

There are certain limitations of input-output models and Social Accounting Matrices based on their assumptions. These models assume that productive relationships remain stable over time, but this is not necessarily true. However, more importantly these approaches fail to take into account relative prices and possible substitution effects. Nevertheless, on the positive side in comparison with more

complex models they are transparent and easy to understand. Their mechanisms and assumptions are easier to grasp and for this reason policy makers have a much greater confidence in their results and predictions.

The second type of quantitative approach is the Computer General Equilibrium Models (CGE). This model estimates how an economy may react to specific policies, new technologies, and external shocks or changes in demand. In most cases, the assumptions built into CGE models are neoclassical in character – i.e. households and firms respond to price signals and pursue some form of optimizing decision-making. CGE models typically place a much stronger emphasis, than input-output and SAM models, on the role that prices play in influencing behaviour and determining economic outcomes. The core of a CGE model is typically an input-output model, showing the various relationships between industrial sectors and final demand. The input-output framework is typically supplemented by a variety of elasticities, which describe how demand reacts to changes in prices. The advantage of the CGE is that they can understand more dynamic situations and provided that they have been designed to take on board certain assumptions, they can undertake more detailed analysis beyond macro or sector level outcomes. On the down side CGEs are expensive to develop, depend on highly skilled individuals and are based on a number of complex interdependent assumptions, all of which makes them less attractive to policy makers.

Within many countries sector based models are also used to predict future employment outcomes, especially within the energy sector. On a simplistic level these models estimate employment outcomes by expressing current employment as a ratio of current generation (eg. jobs per MW in the wind industry). This ratio is then multiplied by the future amount of energy generated in order to estimate future levels of employment. Skills and occupational profiles can be obtained using a similar procedure. This method has the advantage of being transparent and intuitive. It does have a number of limitations, but again, its usefulness will depend on the research objectives. The method will yield estimates of the number of direct jobs that can be expected from a given level of energy generation in any given sector. However, it will not necessarily provide estimates of indirect or induced job creation. These estimates can be derived by using an input-output model to analyze the indirect and induced job creation associated with the direct effects.

So far we have assumed that each of the quantitative models are distinct and isolated approaches. However, this is far from reality and in most case multiple approaches or hybrids are normally used. For instance, an input/output model can be linked to an energy scenario in order to produce estimates of indirect and direct jobs generated. Indeed, as an ILO commissioned report states basic models, such as an input-output model, can be combined with top-down (e.g. macro-economic) and bottom-up (e.g. sectoral information from energy scenarios) to produce a reasonably coherent methodology (Irrek, Bunse, and Rudolph, 2007).

The most significant difficulty facing the use of quantitative methods for estimating the skills associated with a transition to a low carbon economy is that the necessary data for variables which would allow the exact identification of green activities does not exist. Understandably, this represents a significant challenge, especially amongst developing countries where time series data is absent. In order to get around this problem, researchers tend to use multiple sources of data, often constructing proxy industries to represent a new type of activity. Moreover, when data is missing, information from other sources which apply to a different, but closely related, context can be used to produce a reasonable approximation of the data actually needed

Another limitation of existing quantitative analysis is the failure to look beyond the use of standard occupational classification and to estimate what the transition to the low carbon economy means quantitatively for the new and changing occupations that are emerging, or to link this to estimates of gaps in skills supply. In an attempt to overcome this limitation the EC and ILO have developed a comprehensive synthesis model that draws on previous methodologies to suggest how researchers may move forward with a framework that distinguishes between the following levels of skills analysis: macro-economic, sectoral level, occupational and skills level, and training and educational level. This is complex approach that offers guide-lines on how the short-coming of existing approaches may be addressed, but it is a cumbersome data hungry model that may suffer some of the limitations of former manpower planning approaches.

Qualitative Approaches

Qualitative research methods can form an important part of the processes for identifying the skills associated with a transition to a low carbon economy. They form an important part of most research projects, and are the dominant part of many. However, in many instances the dichotomy between qualitative and quantitative methodology becomes blurred, particularly when standard occupational and industrial classification systems cannot take into account changes occurring on the ground and the only recourse is to also use qualitative methods to understand such changes.

The blurred distinction between qualitative and quantitative approaches can be seen in the use of small scale surveys. These can be highly structured, to the use of very open formats and their purpose is to gather more detailed information. Normally, structured approaches use questionnaire for surveys undertaken through paper questionnaires, by telephone or in-person interviews or through web or e-mail survey methods. Less structured surveys are mostly undertaken by interview, asking open questions to tap the specialist understanding of each of those interviewed. For instance, structured and quantitative survey approaches are useful for filling in hard information that may not be available from standard statistical sources, and for systematically collecting information on issues such as occupational and skills change labour market conditions, areas of skills shortage or deficiency, and the existing understanding of practitioners about the key factors currently driving industry change.

One of the most innovative qualitative forecasting techniques involves using the Delphi technique. This relies on expert assessment and involves the collection of structured information to predict changes in skills or occupations in response to expected future growth of green industries. This approach has been commonly used by sector bodies, in both the UK and South Africa, to understand what skill sets may occur as a result of certain future scenarios.

Another important qualitative approach is the use of focus groups. Unlike Delphi techniques these do not rely on experts and instead focus upon workers or employers whose knowledge, perception and opinions are important for answering a research question. For instance, focus groups could be used to obtain perceptions from workers in a particular industry about how their skills are changing in response to new greener production techniques and correspondingly how they were trained.

Case studies are probably one of the most common qualitative techniques used for undertaking an in-depth study of a particular firm, industry or training institution. Case studies typically draw on a variety of methods for compiling and analyzing information: including secondary sources (e.g. financial statements, annual reports, trade journals, or journalistic accounts), quantitative data, and qualitative methods (e.g. interviews, surveys, and focus groups). Case studies are not representative or valid in statistically, but they are representative in explaining relationships, such as how changes in

production techniques in response to a demand for a greener product can impact on what skills people require to perform their job effectively.

Institutional approaches and social partners

Labour market institutions can provide a mechanism for the identification of skills and for providing the basis for social partners to make more informed decisions about investment in skills, or in the type of skills being delivered. Normally, labour market institutions are made of a combination of the following structures: sector type skill councils, employment services, Labour Market Information Systems (LMIS), public private partnerships, and migration policy. Each country will have developed a unique response or set of arrangements to suite their own needs.

In many countries sector frameworks play an important mechanism for identifying of skill needs and for the transfer of findings into practice. Within the UK there are 25 government sponsored sector skill councils that are responsible for provision of skills in their respective sector. Some of the councils play an important role in reducing carbon emissions. For instance, the sector skill council for manufacturing (SEMTA) is working alongside businesses and the National Skills Academy for Manufacturing to ensure that low carbon skills are being provided in sufficient numbers for the existing and current workforce.

In Australia skills development policy is driven by the work of 11 industry-led Industry Skills Councils (ISC), which are mandated with identifying and responding to the skills needs of their respective industries and subsequently advising Skills Australia. The ISCs are privately registered organisations whose funding is substantially provided by the Australian Government. Amongst many others, Government Skills ISC identified skill needs and developed training packages for water management, Agrifood ISC for sustainable farming, Construction, and Property Services ISC for waste management, Manufacturing Skills Australia (MSA) developed a ‘Competitive Manufacturing’ qualification.

In France they don’t have the sector councils, but they do have Contracts of Prospective Studies (les Contrats D’etudes Prospectives) which have been implemented by the State since 1988 (Guegnard, 2007). The contracts define main trends for occupations, jobs, qualifications and skill needs and their evolution in the context of economic, demographic, technological, organizational and social changes. The studies can be performed in a particular sector or region, or for a group of occupations. It is co-funded by the State through a contract between the State and professional bodies, and sometimes trade unions. When it comes to green jobs, a contract study was conducted in the recycling industry. The study proposed a vision of the industry perspective until 2020 based on three scenarios of the market development based on different assumptions of global growth. Therefore France is actively using the established features of its labour market information system and social dialogue mechanisms for anticipation of skill needs for green jobs

Public employment services can also play a major role in measuring the green jobs arena and in matching supply and demand, but this requires an updated classification with corresponding competences. The Public Employment Services method of matching on competences is quite new for many countries, but the Netherlands and Belgium seem to have relatively well developed approaches. However, solely matching on competences is not enough and requires the matching of education, hard skills and years of experience along with soft competences. Generic and core skills such as, literacy and numeracy, communication, leadership, entrepreneurial, information technology, and innovation skills have been identified as being critical for green jobs (Cedefop, 2010b; Strietska-Ilina, O. et al.,

2011) and are transferable across occupations. These types of skills that are relevant for all green jobs should be identified by stakeholders and formally standardized for job matching at national and possibly even international levels.

With regard to Labour Market Information Systems (LMIS), the existing evidence would suggest that significant challenges exist for the collection, collation, analysis and dissemination of information about green jobs. Nevertheless, there are examples of best practise, including in the USA where State governments can access a US\$ 50 million in grant funds for Workforce Agencies to collect, analyze, and disseminate labor market information, and to enhance the labour exchange infrastructure for careers within the energy efficiency and renewable energy industries (USDOL ETA Federal register, 2009).

There are also a number of examples where public/private partnerships have played a significant role in addressing skill shortages for the transition to a low carbon economy. One of the best examples can be found in Denmark where the government has been successful in developing a renewable energy industry in two islands, of Lolland and Falster. As part of this project, a holding company named LOKE– Lolland Energy Holding was created by the municipal governments of the two islands to finance future regional projects, with a preference for projects that lead to local job creation and new educational programs (see: Martinez-Fernandez, Hinojosa, and Miranda (2010).

A number of countries have immigration policies that contain skills as part of their ranking for visa application, including Canada, France, Germany, Japan, the Netherlands and Switzerland. Most of these countries publish a short list of occupation that gives priority to workers with recognised competencies. In theory this could provide a means of identifying appropriate skills needed for visas. However, this depends on the taxonomy used to measure green jobs and classification systems vary from country to country.

Implications for policy and analysis

At the nation state level, governments, in conjunction with stakeholders and where appropriate development partners, need to take a more pro-active role in ensuring that improved alignment occurs between policies for facilitating the transition to a low carbon economy, and those for skills and human resource development. When such a synergy occurs it is much easier to determine possible targets for green jobs, as well setting-up monitoring and reporting systems to track progress and signal when changes need to occur in policies, or even predefined targets.

Currently, most of the works on identifying skills associated with the transition to a low carbon economy have focused primarily on understanding the implications of large projects, specific initiatives or attempting to predict future changes in the market. While this approach is commendable, the costs of building of complicated data models, combined with the past failures to predict future trends, have resulted in the search for alternative approaches. For these reasons it is important to ensure for governments, planners and stakeholders align more closely current policy frameworks associated with the transition to a low carbon economy, and those for skills development.

For most developed countries, the process of aligning frameworks for a low carbon economy with those for skills development it is not that difficult. For instance, the European Union has developed a renewable energy strategy that contains targets for 2020, and at the level of the nation state each EU member has developed, or is in the stages of putting together, a detailed National Renewable Energy Action Plan. Each of these National Action Plans will contain detailed information on specific targets and trajectories that will be achieved over the next 10 years. However, what is missing is the skills or

employment implications of achieving these targets. Clearly, the employment and skill implications of these different targets should be addressed by each of the individual nation states. Obviously, this should be done in synergy with the Skills and Employment Action Plans also being developed by each of EU states.

At the level of the developing or middle income countries, governments and stakeholders also need to ensure that the skills and employment implications of the move towards a higher skill economy are also mainstreamed into existing frameworks. On the one hand governments and stakeholders could approach this issue through the incorporation of the green job agenda into existing employment and skill strategies. On the other hand the area of green jobs could be developed in conjunction with environmental, agricultural, transportation, construction or other sectors associated with the transition to a low carbon economy. Obviously this would require political support for these processes.

Once the area of green jobs has been incorporated into existing policy frameworks it will be easier to identify the appropriate method or approach for determining what skills are needed in the transition to a low skill economy. The available evidence suggests that it is best to use a hybrid approach that combines qualitative and quantitative methodologies. Similarly, the focus of the research needs to occur at the macro, sector and occupational/skill level.

In a developing country such an approach may prove problematic, particularly where resource, data and capacity constraints exist. When such constraints occur the most practical starting point is to obtain signals on the specific skills that people may require in the transition to a low carbon economy. The most effective way to obtain signals is through focus groups or by using the Delphi method. The emphasis within these approach is on obtaining experts anticipated perception of future trends for green jobs; and for also obtaining workers and employers perception of changes that are occurring in the workplace as a result of the introduction of greener technologies or new working practices associated with reduction in carbon emissions.

Social partners can also play an important role in managing these processes and in ensuring that the findings are valid. Where possible this initial contextual information should be supplemented by analysis of the Labour Force Survey (LFS) or household data. If longitudinal data is available this should be used as the basis for undertaking some analysis of the break-down of green occupations according to priority sectors where transitions are taking place to low carbon activities. This data could also form the basis for a simple regression analysis in order to signal the extent to which future green jobs may occur within a specific sector. In addition, if the resources are available it might be possible to implement a small scale survey of employers. This could help provide more evidence of the greening of specific jobs and support the validation of other findings. Adopting this approach could provide the basis for more informed decision making and signal where decision need to be made for changing supply.

However, in an advanced industrial economy where more resources are available, the government, or relevant planning or sector agency, should contract the process of identifying skills to an external contractor, possibly a university who would take responsibility for deciding on the appropriate methodology and for the process of data collection and analysis. However, the government agency should ensure that stakeholders play an active part in this process and that an appropriate methodology is developed to ensure that the quality outputs are produced. The importance of involving stakeholders in this process cannot be under-estimated. As mentioned previously, stakeholders will help ensure legitimacy of process and supporting the use of the end products in decision making processes.

The utilisation of information about green jobs

Without the appropriate dissemination and utilisation of information about what green jobs are in demand there is little point collecting or analyzing this data. However, it is important to realise that this information will only be utilised if a demand exists for this information. At the national level, the demand, and subsequent utilisation of information on green jobs, will come from plans and policy makers, especially those engaged with the development of targets and monitoring of progress.

However, it is equally important to ensure that a demand for information on green jobs also comes from learners, employees, social partners, education/training institutions and all those involved in the provision of skills. With regard to the demand for this information from learners or employees it would be important that they learnt about the expected future opportunities that are expected to occur in the field of green jobs. Indeed, if young people are made more aware of what employment opportunities are available in the green job sector they will think seriously about receiving the appropriate forms of training, especially during the current economic down-turn. Similarly, education/training institutions would also be keen to obtain such information in order to adjust the content of the course in preparation for increased future enrolments.

As regards employers and other stakeholders it might be more difficult to persuade them about the importance of adjusting their behaviour in response to the greening of labour markets. Indeed, employers will often only change when there is a perceived crisis or something has an impact on their profit margins. For these reasons it will become increasingly important for employers to understand about the implications of the transition to a low carbon economy, especially in terms of how it will impact on their production techniques and skills, and also what will happen if they take no action. The success of this message will depend on the mechanisms and format for dissemination. Therefore, those responsible for disseminating information about green jobs must pay attention to the group they are targeting, the format of the information they are presenting and what medium they are using to portray the message. Not only will this help dissemination information about the nature and extent of green jobs, it will also ensure that people act upon this information.

Moving forward and future research

Most of the existing techniques for identifying the skills associated with the transition to a low carbon economy have been broad and very general in their application. On the one hand this helps highlight issues and approaches that can be used to determine skill needs. On the other hand because the vast majority of existing techniques are so general they don't relate to the specific context of individual countries and it is difficult to understand their practical application, including how to interpret the data or how it can be used to inform policy making processes. Therefore, in order to move forward it is necessary to be more country or region specific, and also to identify how to implement these models. Once these models and approaches have been implemented, the next important task is how this information can be utilised.

All of this has important implications for the EC and ILO. In the EC there is an ideal opportunity to ensure information about green jobs is integrated into current frameworks for reducing carbon emissions and supporting usage of sustainable energy forms. In 1998 the European Parliament established targets for 2020 that have to be achieved by member states for the successful transition to a low carbon economy. Amongst the key targets are that carbon emissions will be reduced by 20% through improved energy savings and conservation measures, and also that the usage of renewable energy will increase by 11%. Moreover, as outlined earlier, each of the EC member states have

developed National Action Plans to achieve these targets. On the downside no attempt has been made to address the skill implications for green jobs. Within the UK the head of the country's Trade Union Congress argued that we are heading for a green jobs crisis unless this skills gap is addressed. Clearly, research is needed on the nature of the skill gap for achieving these low carbon targets in the light of member state's National Action Plans. The contents of such research would provide individual member states with a clear road map of what green skills are required over the next 10 years, including signals on occupations and skills in high demand. There is no doubt that such information would be readily utilised by providers, stakeholder and learners who interested in gaining new skills, or in upgrading their existing ones. However, what might be equally useful is the setting-up of a web porthole at the EC level to facilitate the matching of the supply and demand for green jobs. This would facilitate the EC adopting a more regional response to the greening of labour markets across member states.

With regard to the ILO most of the social partners are in the developing world and so future research much centre on how information on green jobs could be utilised in this context. Once again it will be important for the ILO to link requirements for green jobs within existing policy frameworks. Unless this occurs there is a danger that existing models will be used to understand future markets, and given the cost involved, not to mention the unpredictability of markets, this is not to be recommended in the context of developing countries. Therefore, it would be more helpful to develop a toolkit that helps governments and stakeholders to mainstream green jobs into existing government policies. The development of such a tool-kit would require some field research in order to identify how to approach mainstreaming, and whether it is best to integrate green jobs within core Ministries, such as Agriculture or the Environment, or whether it is better for green jobs to be part of TVET strategies within Ministries of Education or skills strategies within Ministries of Labour. Obviously, this would probably differ from region to region and the tool kit would need to take this into account.

If there is one consistent theme that has policy implications for decision makers resulting from this research it is that countries cannot chase markets, they must be the leaders. What this means is that the policies and programmes designed and implemented on the macro level by governments should be the main factor driving skills development within their economy. As the research has shown, private enterprises will usually only react to the market and bottom-line pressures and not strategically plan for workforce development. This strategic workforce development planning will only be undertaken by policy makers and if done properly can result in a virtuous circle of a highly skilled workforce attracting greater investment in low carbon industries, leading to higher levels of employment, allowing for increased consumption of those industry's products, which will then provide for even greater investment, and so on.