Anticipating skill needs for the low carbon economy? Difficult, but not impossible

ILO

International Labour Office

Geneva

European Union

1. Why is it important to identify skill needs for the green and low-carbon economy?

Transitions to greener economies are having a significant impact on certain sectors of a country's economy and on the demand for new types of skills and the changing nature of occupations.

Skill shortages are acting as a barrier to driving transitions to greener economies forward. Scaling up the use of green technologies, for example, requires people with the right set of skills to adapt them. Also, the success of implementing green policies is dependent on the availability of skilled people. People losing jobs in transition to a low carbon economy require new skills that are valuable for upcoming job opportunities – and it is critical to know the type and quality of skills needed. Finally, skills-led strategies to support the green transition can serve as a driver of change in their own right: availability of suitably skilled

workforce attracts investors in green industries; and environmental awareness encouraged through education and training boosts demand for green products and services.

Identifying and anticipating skills needed for the green and low-carbon economy must precede training decisions so that skills acquired are relevant for the labour market.

Who will use information on skills requirements?

Education and training providers need to know which training curricula to update, what new skills are required, if new courses in areas such as renewable energy or green building should be established, and if training should be scaled up or down.

About this research brief

This research brief is a digest of the *Comparative Analysis of Methods of Identification of Skill Needs on the Labour Market in Transition to the Low Carbon Economy* (ILO, Geneva, 2011c), which resulted from a joint EC/ILO project *Knowledge sharing in early identification of skill needs*. The project covered over 30 countries worldwide – both developed and developing. It was supported by the EU Programme for Employment and Social Solidarity – PROGRESS (2007-2013). It was implemented in the framework of the Green Jobs Initiative – a partnership between the ILO, UNEP, IOE and ITUC. The study draws on a background report from the Political Economy Research Institute (PERI), analysis of data availability and classifications, expert opinions and a broad literature review. The findings were vetted at a validation workshop.

Government officials and training experts in charge of designing and updating qualifications, monitoring training systems, or devising skills strategies at national or sector level, need to be aware of new trends in skills requirements for green jobs. Where governments or others propose specific initiatives to contribute to the transition to the low carbon economy they should analyze the skills requirements and include a plan for how these can be addressed in the proposal.

Employers and workers at company or sector level also benefit from information on present and future skill requirements when designing and implementing human resource development strategies aiming to make work processes greener.

Vocational guidance and employment service professionals use the information to guide seekers of jobs or training to acquire skills relevant for the green job market.

Policy makers and labour market information professionals require information inputs about future skill needs for the green economy to inform policy decisions on budget allocation to various (re)training measures and on regulation of migration. Expected skill shortages in, for example, engineering professions for green technologies can shape migration policy decisions.

2. What is so difficult about it?

There are five specific challenges when researching skill needs for the green and low-carbon economy.

First, boundaries of sectors relevant for transitions to greener economies such as renewable energy, organic agriculture or energy efficiency mostly do not match standard sectoral definitions (Figure 1). Special constructs are required to use statistical information available and create new "synthetic" sectors for quantitative analysis that are usually segments of sectors as defined in standard sector classification.

Additional research is needed to determine the size of the green sub-sector. Businesses involved in the transition to the low carbon economy buy from other businesses, which generates indirect employment. Their employees spend money, which generates induced employment. It is good practice that researchers make chosen boundaries transparent.

Second, occupations relevant for green sectors are a moving target. In a context of rapidly changing technologies, the skills content of occupations changes. Occupations like bricklayers or painters, for example, take on additional tasks such as outside wall insulation to improve energy-efficiency of buildings. In entirely new fields such as renewable energy, new occupations emerge such as solar photovoltaic installer or biomass plant technician. These occupational changes are generally not reflected in national classifications of occupations and consequently do not figure in statistical systems. Therefore, researchers should be explicit about how they cope with mismatches between standard definitions and realities.

Third, research on skill needs for green economies is often compromised by a lack of sufficiently good statistical information. Labour force surveys or employers surveys are key sources of statistical information for skills research. Yet they often do not allow for a clear attribution of companies or occupations to specific green sectors,

Figure 1. Schematic overview: Wind energy sector composed of synthetic sectors based on standard ISIC sector classifications*
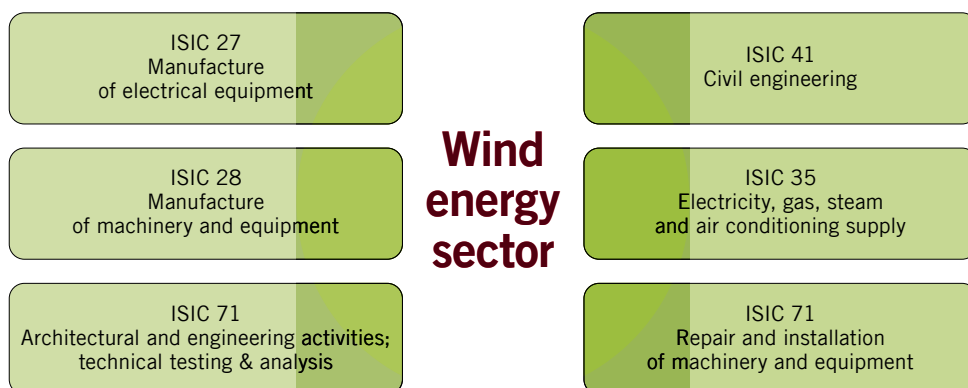
* ISIC is the International Standard Industrial Classification of All Economic Activities.

for the reasons pointed out above. This can be addressed by adding a small number of questions to existing surveys, or by conducting a new survey. In developing or emerging countries, statistical data is often not sufficiently disaggregated to draw useful conclusions on occupations and skills. Moreover, statistical surveys may be conducted much less frequently than in developed countries, limiting the scope to identify trends in data useful for constructing projections.

Fourth, it is difficult to define green jobs in a way that is satisfactory for all purposes. While there are many competing definitions, most practical skills research questions are sufficiently specific so that research can proceed without any requirement for a universally agreed green jobs definition. International bodies discuss possible international classifications of green activities. In the meantime every researcher on skill needs for green jobs should define the terms and concepts they use.

Fifth, different types of jobs have different employment dynamics. These types are operations, maintenance and management jobs, jobs in manufacturing and services, and installation jobs. In transition to green and low-carbon economies new technologies play a particularly important role. This is why the distinction between these types is relevant. Jobs in operations and maintenance are likely to be the most stable in number, increasing over time as more low carbon technologies are in place. Demand for jobs in manufacturing, services and installation are likely to be less stable and more dependent on policy incentives. This can create booms and busts in demand for workers, for example in renewable energy sectors. Projections should take account of this.

> **Box 1. Defining green jobs**
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> **ILO:** Green jobs help reduce negative environmental impact, ultimately leading to environmentally, economically and socially sustainable enterprises and economies. Green jobs contribute to the reduction of energy consumption and use of raw materials, reduction of greenhouse gas emissions, minimization of waste and pollution and protection of ecosystems.
>
> **Eurostat:** Jobs in the environmental goods and services sector are defined by economic activities that produce goods and services purposefully aimed at protecting and managing damage to the environment. These goods and services must have an environmental protection or resource management purpose as their prime objective.
>
> **US Bureau of Labour Statistics:** Green jobs are all jobs in establishments that produce green goods and services (output approach), and all jobs in establishments that use environmentally friendly production processes and practices (process approach).

# 3. How to embark on identifying skill needs for the low carbon economy?

The detailed design of research into skills for the transition to the green and low carbon economy is complex. It needs to take into account the above mentioned challenges and differences in research questions and priorities between countries and research projects. Therefore, a universal methodological approach is not feasible.

It is possible to distinguish between four main levels of skills analysis: macroeconomic; sectoral; occupations and skills; and training and education (Figure 2).

The levels covered by a research project and a method or methods chosen depend on the research questions posed. Most skills research projects concerned with the transition to the low carbon economy span more than one level, but few span the full range. Most include substantial research at sector level. Different methodologies are appropriate to different levels, and choices have to be made about alternative methodologies within each level.

Figure 2. Levels of analysis in skills research

Macroeconomic Level

Sectoral Level

Occupational Level | Skills Level

Training and Education Level
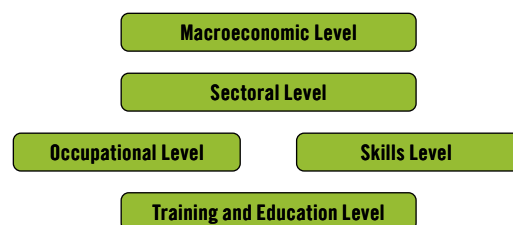
Table 1. Skills research questions and appropriate types of methodology

Level of Question	Type of Question	Some Key Headline Questions	Type of Methodology (Whole Economy or Sector)
Jobs	Quantitative	How many direct jobs now and in the future?	Quantitative, Qualitative
	Quantitative	How many indirect jobs now and in the future?	Quantitative, Qualitative
	Quantitative	How many induced jobs now and in the future?	Quantitative, Qualitative
Occupations / Skills	Qualitative	What occupations? How should they be defined? Where are the boundaries between occupations?	Qualitative
	Quantitative	How many people in each occupation? What is the resulting demand for skills?	Quantitative, Qualitative
	Qualitative	What skills and competencies? How do these relate to occupations?	Qualitative
Training and education	Qualitative	What sources of skills are available? What types of training and education are needed? How can they be provided?	Qualitative
	Quantitative	What is the existing stock of people with the right skills and training available to be recruited? What is the current flow of newly trained people available to be recruited? What flow will be needed in future?	Qualitative, Quantitative

Methodologies to research skills for the transition to the low carbon economy involve quantitative modelling or qualitative research. Some questions can be answered purely through qualitative research. However, in almost all cases research involving quantitative modelling needs data and contextual information that is not available from standard statistical sources, and so must be obtained through qualitative research (see boxes 2 and 3). Qualitative research is even more important in developing and emerging countries than in developed countries, as deficiencies in data availability are likely to be greater. Even where data availability is poor, methodologies are available that are workable.

There is no single correct methodological approach to **macroeconomic analysis**. Input-output, social accounting matrix (SAM), dynamic social accounting matrix (DySAM) and computable general equilibrium (CGE) models may be appropriate depending on the context. Models that look forward beyond the short term should take account of time dependencies such as likely changes in labour productivity over time.

Most quantitative modelling of the employment implications of the transition to the low carbon economy includes both sector level and macroeconomic analysis, and bridges between them. Where the research question is about economy-wide skills implications of the transition, the core approach adopted is usually

Box 2. Qualitative research as an input to modelling

The Political Economy Research Institute (PERI) at the University of Massachusetts, Amherst undertook business case studies to help understand emerging green sectors in terms of factors such as their purchases from other sectors and their occupational composition. They used the information gathered to estimate parameters for synthetic sectors within a model constructed to estimate the employment effects of "clean economy" elements of the US government's American Recovery and Reinvestment Act (ARRA) stimulus package.

A study by Comhar SDC in Ireland reviewed plans for future wind farm electricity grid connections to estimate the additional wind generating capacity that would be added each year to 2020, and used this as the input to a simple quantitative model to project direct and indirect employment over the period.

macroeconomic, but with the findings of research into sectors important to the transition, such as energy and building construction, embedded within the model. For example, many countries are interested in the economy-wide impact of measures (such as carbon taxes) to decarbonise energy intensive sectors on factors including employment. A government research project in Finland addressing this question embedded the findings of sector level research on the energy sector and on a number of energy intensive sectors into a CGE macroeconomic model to address this topic.

Where the main focus of the research is at **sector level**, this is done chiefly to allow wider employment effects of developments at the level of the sector to be estimated. A wide variety of approaches to quantitative modelling are adopted at sectoral level, usually starting from a qualitative analysis to identify the main factors likely to drive green employment into the future. For projections that look more than a very small number of years into the future, model parameters for sector level models are usually chosen to reflect plausible scenarios rather than firm forecasts.

Because of uncertainty about the future, skills responses relating to the transition to the low carbon economy should be designed to be robust in the face of a range of possible medium- and long-term futures. The use of sectoral scenarios that include quantitative and descriptive elements facilitates this.

Projections of future employment derived from scenarios, short term forecasts and modelling can be disaggregated into projections by **occupation** using information on the occupational composition of each sector. At its simplest, this is derived from labour force survey data, although adjustments to estimates of occupational composition based on labour force survey data may be made by a researcher to take account of changes in composition known to be underway. Case study or enterprise survey data can be used in the absence of a suitable labour force survey.

Projections of demand for skills can be estimated based on projected changes in employment by occupation and on assumptions about the numbers in the occupation that will have to be replaced each year.

Research into specific **skills** requirements requires qualitative research methods, as does research into new and changing occupations. Examples of questions include:
- What new or different skills are needed by an architect to design and project manage greener building projects?
- What skills and competencies are required to advise businesses on energy efficiency?

Box 3. Areas for linking qualitative methods to economic models and other quantitative approaches

Defining sectors. Qualitative information from case studies and expert assessments can help resolve the problem of different sector boundaries. Specifically, the composition of expenditures on green activities can be identified and linked to the relevant sectors of the economic model.

Occupational and skills composition. Detailed information on occupational categories and skills for relevant sectors or synthetic sectors may not be available. Qualitative methods can provide some baseline information. When combined with the employment estimates from quantitative approaches, the qualitative information can provide insights into skills demand and gaps.

Direct employment estimates for targeted activities. If the level of sectoral detail is insufficient to model direct employment effects using input-output and related models, qualitative methods may yield rough estimates of direct employment. If these estimates can be scaled up to the national level, they can be used in input-output models and SAMs to estimate indirect and induced effects.

Projecting, forecasting or constructing scenarios on what is likely to happen. In most cases, constructing plausible projections and scenarios for the future requires a good qualitative understanding of trends, particularly at sectoral level.

- What are the new skills that a mechanical engineering technician or millwright needs to work as a wind turbine technician?

Research into **training and education** requirements arising from anticipated skills needs also requires qualitative methods. Examples of questions include:
- Where do new recruits to meet a skill need (such as wall insulation installer) actually come from? Is there a better way to train them?
- What should be changed in a course to prepare trainees and students to meet new skills requirements associated with the transition to the low carbon economy? For example, how should technician and engineer level courses in electrical engineering be changed to better meet the skills needs of renewable energy sectors? Rather than adapting existing courses, is there a need for new specialised courses in, for example, solar energy engineering?

Comparing projections of numbers qualifying from training and education courses with projections of skills demand is challenging. New entrants into occupations may be recruited from a variety of sources. For example, in some

countries energy auditors may be qualified in architecture, a range of engineering disciplines, energy management, or in one of the construction trades, often with a supplementary qualification from a short course in energy auditing. Graduates of training and education courses may go to a variety of destinations. For example, graduates in electrical engineering may go into electricity transmission, electricity generation, design of electrical products, or into a wide range of other types of job that require a high level of numeracy. Comparisons require a good knowledge of the types of recruit that businesses seek and a good knowledge of where the graduates of relevant courses actually go.

4. How does inter-institutional collaboration contribute to anticipating skills for the low carbon economy?

No matter how sophisticated the methods and how developed the statistical database, informed decisions on skills development are not possible without an effective institutional framework – inclusive, coordinated and collaborative. Governments, employers and workers' organizations all have important and complementary contributions to make in terms of expertise, resources and commitment to act. Social dialogue contributes to effective identification of the right issues to study, to high quality analysis, and to effective implementation of skills policies and actions proposed on the basis of the research.

Effective institutional arrangements for skills anticipation often also involve providers of training and education.

In countries with developed systems for early identification of skill needs and labour market information, skills anticipation for the transition to the low carbon economy does not require new institutional approaches. Existing institutional mechanisms such as sectoral skills councils (SSCs), observatories and skills advisory groups typically provide a forum for social dialogue that involves all relevant partners. However, where existing systems of skills identification are organised along sectoral lines, it does require initiatives to bridge between and across sectors – in order to capture the synthetic character of green economic activities.

Examples of recent initiatives:

- In Australia, a Green Skills Agreement promotes collaboration and coordination between government, employer and worker representatives, the education and training sector and community organisations. Its mandate covers developing national standards, upskilling training practitioners, reviewing training programmes and reskilling vulnerable workers in the transition to a low carbon economy.

- In the UK, the Alliance of SSCs works to support SSC members in cross sector activity, including identifying and addressing skills for a low carbon economy, and recently convened a new high level Cross Sector Strategic Group to lead on this. The Alliance also works in a collaborative partnership with the UK Commission for Employment and Skills to ensure that top priority cross sector areas are tackled effectively. Some SSCs have developed specific skills strategies for sectors affected by the transition to a low carbon economy, such as LANTRA (land based and environmental industries), SEMTA (manufacturing), SummitSkills (building services engineering), ConstructionSkills and Cogent (chemicals, nuclear, oil and gas, petroleum and polymers).

Sectoral institutional frameworks have proved to be an effective mechanism for identifying and addressing skill needs for a low carbon economy. While anticipating skills for green jobs has been mainstreamed in many existing institutional structures, such as sector or industry skills councils, new institutions are also introduced into existing systems to focus on green economic activities in some cases.
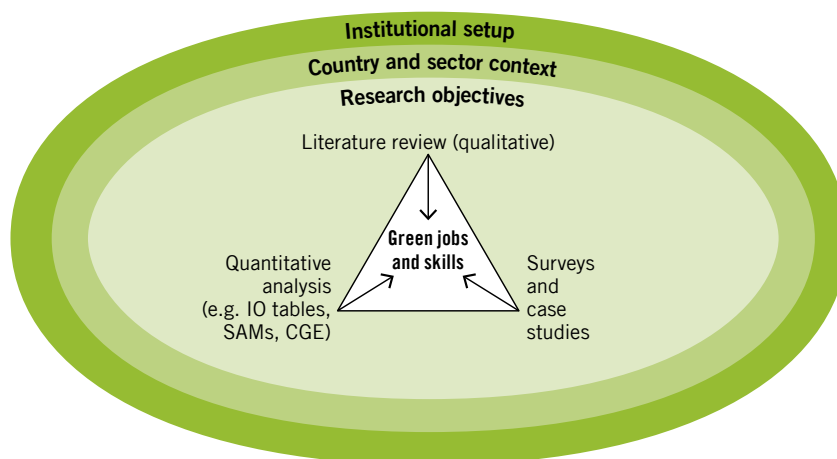
No matter how advanced **Labour Market Information (LMI) systems** are, some countries still invest in LMI upgrading to meet the demand of transition to a low carbon economy. They invest not only in the labour market monitoring and data collection, and research into evolution of occupations, but also in infrastructures which deal with job matching and information provision for careers in the low carbon economy. The role of public employment services in matching supply and demand is invaluable but their efficient services to green job seekers and recruiters are also dependent on upgraded LMI systems.

Institutional arrangements often shape the research approach. Regional institutions produce regionally focused research. Countries with strong sectoral institutions (many of them Anglophone) tend to produce sectorally focused research. Countries that use thematic observatories (particularly Francophone countries and Spain) tend to use observatories also for identifying skills for a low carbon economy. Countries with decentralised arrangements supplemented with research commissioned by ministries (such as Germany) still use mainly similar arrangements. In the US, the key policy work undertaken for skills anticipation purposes fits into broader work by the Bureau of Labor Statistics and O*NET. In Ireland, where skills anticipation research is undertaken by a group established to advise the government, key research has been undertaken by that group.

The institutional set up shapes research approaches alongside country and sector contexts, research objectives and methods selected subsequently (Figure 3).

In many **developing countries**, systems for skills anticipation are much less developed than is usual in developed countries. In their attempt to satisfy the information thirst on skills for the low carbon transition, these countries tend to create a parallel system of analysis or conduct one-off, non-sustainable, surveys. Neither of these approaches contributes well to developing capabilities in skills anticipation at country level. In countries with weaker statistical and skills anticipation systems, work on skills anticipation for the transition to a low carbon economy should be designed as a building block towards a future national system for skills anticipation rather than a one-off initiative. It represents an opportunity to

Figure 3. Factors that shape research

Institutional setup
Country and sector context
Research objectives

Literature review (qualitative)

Green jobs and skills

Quantitative analysis (e.g. IO tables, SAMs, CGE)

Surveys and case studies

put in place the beginnings of structures such as a national human resource development council involving government, employers, workers and providers of training and education (to facilitate exchange of information) and to establish industry groupings whose role could later be formalised as sectoral skills councils.

Institutional settings are important not only for identification of skill needs and gaps but also in addressing them. Public-private partnerships are particularly useful when it comes to translation of the identified skill gaps into training programmes. Labour market signals from industry can be directly addressed by training institutions as the result of the partnership. Businesses, governments, training institutions and other partners commit themselves to the agreed steps to meet the needs of the green economy.

Examples of recent initiatives:

- The Fund for Electric Energy Savings is a joint initiative between a state-owned utility (Federal Commission for Electricity), the Mexican Electric Workers trade union, and some businesses, to develop a national training programme on energy efficiency delivered through local educational institutions.

- The Apollo Alliance is a coalition of labour, business, environmental, and community leaders in the US, focused on catalysing activity in clean energy and green employment. It promotes investments in green activities and emerging technology, as well as in related education and training.

- The Aldersgate Group is a coalition of businesses, environmental groups and individuals in the UK which engages with government and other decision makers to contribute to the future development of economic, environment and sectoral policies.

- The Professional Reference Centre for Construction, established by public and private entities in Brussels, identifies, develops and provides training for construction workers and facilitates placement between newly trained workers and employers. The centre relies on feedback from industry and on information on technological developments to anticipate future needs.

5. Conclusion

While anticipating skill needs for the low carbon economy is complex, and poses significant challenges, it can be done. Difficulties with definitions of occupations and sectors, shortcomings in statistics, problems with defining a green job, and differences in the dynamics of employment in different types of green activity can all be overcome. Collaboration between governments employers and workers' organizations, contributes to the identification of the right issues to research, to high quality analysis and to the effective implementation of skills policies and actions based on the research.

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