

Employment potential of the green economy

Marco Torregrossa

1. Introduction: Background and definition of green jobs

The purpose of this chapter is to assess the employment potential of the green economy. To this end, a definition of green jobs is essential. Green jobs are jobs that reduce the environmental impact of economic activity, ultimately to sustainable levels. This chapter broadly defines ‘green jobs’ as work in industry, services and administration that contributes to preserving or restoring the quality of the environment. However, ‘green’ and ‘green jobs’ may also be further defined on this broad basis. Several international institutions – such as Eurostat, UNEP and the ILO – define ‘green jobs’ along the lines of specific activities and sectors that are active in the green economy and contributing to improving the environment.

More specifically, the United Nations Environmental Programme (UNEP) defines green jobs as

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.

According to the International Labour Organisation (ILO):

‘Green jobs’ does not lend itself to a tight definition but certainly includes the direct employment which reduces environmental impact ultimately to levels that are sustainable. This includes jobs that help to reduce the consumption of energy and raw materials, decarbonize the economy, protect

and restore ecosystems and biodiversity and minimize the production of waste and pollution. ... A somewhat wider concept of 'green jobs' might embrace any new job in a sector which has a lower than average environmental footprint, contributes to improving overall performance, albeit perhaps only marginally.

The Eurostat methodology for the 'Environmental Goods and Services Sector' (EGSS) does not define 'green jobs', but measures employment in the EGSS. The EGSS is a heterogeneous set of producers of technologies, goods and services that prevent or minimise pollution and minimise the use of natural resources. Thus, environmental activities are divided into two broad segments: environmental protection and resource management. Only those technologies, goods and services are considered that have an environmental-protection or resource-management purpose as their prime production objective. Goods and services that are not provided mainly for environmental purposes are, therefore, excluded.

Green jobs are found in many sectors of the economy: from energy supply to recycling and from agriculture and construction to transportation. However, many jobs which are green in principle are not green in practice because of the environmental damage caused by inappropriate practices. Moreover, the evidence shows that green jobs do not automatically constitute decent work. Generally, the creation of green jobs is advancing too slowly to contribute substantially to reducing unemployment and underemployment in the world. Moreover, too few of the green jobs that are being created go to those who need them most: young people, women, poor segments of society in developing countries and those suffering from climate change.

The goal identified in this chapter is the creation of more and better quality jobs to move towards a low-carbon economy. This requires the strengthening of education and training systems, as well as supporting skills development activities in both industry and the public sector. A number of examples of good practice demonstrate that public policy, together with private initiatives, can foster green transformation and job growth. These policies focus on equipping young people entering the labour market and older workers mid-way through their careers with the skills required to adopt new technologies, meet new environmental regulations and shift to renewable sources of energy. This will in turn contribute to changing consumer behaviour and triggering market forces to push the greening agenda onwards.

Environmental and climate change policies bring enormous employment opportunities, but also the risks associated with structural change. The EU needs coherent strategies that bring together energy, environment, education and skills development objectives, policies and responsible ministries in order to adapt to climate change and shift to clean and sustainable production and consumption in ways that maximise the creation of decent jobs and make them available to all. Countries that are succeeding in this challenging task are putting a high premium on effective social dialogue, coordination between ministries and communication between employers and training providers.

This chapter addresses the employment potential of the green economy and looks at such aspects as the EU and international approach to green jobs, labour market adjustments in relation to the green economy, employment trends in the eco-industries, the impact of environment policies on employment and the need for improved skills in the workforce. Before drawing conclusions and highlighting some policy recommendations, the chapter also presents a case study of green job creation from retrofitting buildings, as this area has been recognised as one of those with the largest employment potential in a green economy context.

2. The EU and international approaches to green jobs

The EU must create an extra three million green jobs within a decade, European Commission president José Manuel Barroso recently told the European Parliament in his first ‘state of the union’ speech. Following Mr Barroso’s speech, the European Parliament asked the EU executive to develop a strategy by 2011 to encourage the creation of green jobs in Europe, according to a non-legislative resolution which also included support for decent working conditions and pay. DG Employment is currently working on an action plan to be issued by the beginning of 2012 that should present a broad EU strategy to promote green jobs.

The EU new strategy for sustainable growth and jobs, Europe 2020, also puts innovation and green growth at the heart of its blueprint for competitiveness. It follows on from the European economic recovery plan, a fiscal stimulus of around 200 billion euros launched in 2008 that focused investment on clean technologies and infrastructure. As part of the Europe 2020 Strategy ‘An Agenda for New Skills and Jobs’

is the Commission's contribution to reaching the EU employment rate target for women and men of 75 per cent for 20–64 year-olds by 2020 ((European Commission 2010)). The strategy also highlights the EU's target of reducing the early school-leaving rate to under 10 per cent and increasing the number of young people in higher education or equivalent vocational education to at least 40 per cent.

To make Europe's labour markets function better with regard to advancing the green economy, the Commission proposes thirteen concrete actions that will help:

- to step up labour market reform to improve the flexibility and security of labour markets;
- to give people and businesses the right incentives to invest in training to continuously upgrade people's skills in line with labour market needs;
- to ensure decent working conditions while improving the quality of employment legislation;
- to ensure the right labour market conditions are in place for job creation, such as a lower administrative burden or lower taxes on labour and mobility.

The promotion of green jobs is key to the transition towards a greener economy, also according to international organisations. The ILO 'Agenda for Green Jobs' (ILO 2011) promotes a socially fair transition in which vulnerabilities, changes in the labour market and new business models are addressed by means of inclusive social dialogue. According to the ILO, green jobs help to reduce negative environmental impact, ultimately leading to environmentally, economically and socially sustainable enterprises and economies. In practical terms, green jobs contribute to:

- reducing energy consumption and use of raw materials;
- reducing greenhouse gas emissions;
- minimising waste and pollution;
- protecting ecosystems.

Green jobs can be created in all sectors and types of enterprise, in urban and rural areas. The direct creation of jobs comes with the production of green goods and services. The indirect creation of jobs flows from the required inputs in the making, handling and selling of these goods. Green jobs need to be decent jobs, taking into account the four pillars of the

ILO's decent work agenda (workers' rights, employment creation, social security and social dialogue).

According to the UNEP's 'Green Economy Report' (UNEP 2011), greening relevant industrial sectors can lead to an increase in jobs. For instance, investments in improved energy efficiency in buildings could generate an additional 3.5 million green jobs in Europe and the United States and when developing countries are included, the potential is much greater. Also, according to the Intergovernmental Panel on Climate Change (IPCC), the largest potential within the building sector for reducing GHGs by 2030 is retrofitting and replacing equipment. A worldwide transition to energy efficient buildings could create millions or even tens of millions of jobs and would green much of the existing employment in the building sector (highest gains with lowest cost).

The broader link between climate change and the labour market was also recognised by governments and others when they negotiated the text for the now unrealised United Nations Framework Convention on Climate Change (UNFCCC) Agreement for COP15. Three separate initiatives have come together to ensure the labour dimension of climate change will be a factor in the discussions that surround international climate agreements. The initiatives, in chronological order, are: the International Trade Union Confederation (ITUC) submissions to the Thirteenth Conference of the Parties (COP 13) to the United Nations Framework Convention on Climate Change (UNFCCC) in Bali (December 2007) and to the UNFCCC COP 15 in Copenhagen (December 2009); the United Nations Environment Programme (UNEP) commissioned Report, 'Green jobs: towards decent work in a sustainable, low-carbon world in 2008' (UNEP 2008) which presented the potential labour market impact of climate change; and the provision for a 'just transition' in the negotiating text for the UNFCCC COP 15 Copenhagen Agreement.

The International Trade Union Confederation (ITUC) submission (ITUC 2009) made reference to the effects of climate change on employment. It called for the establishment of a 'just transition fund' to provide retraining and compensation for those whose employment is affected together with the creation of climate adaptation programmes that are labour intensive.

The UNEP report 'Green jobs: towards decent work in a sustainable, low-carbon world' provides quantitative evidence that the labour market

is already changing as governments and industry seek to reduce their dependency on fossil fuels and adapt to the environmental impact of carbon emissions. It finds that there will be net employment growth: jobs will be created, employment will be substituted (move from one industry to another), jobs will be eliminated and existing jobs will be transformed into green jobs.

The negotiating text for the UNFCCC COP 15 Copenhagen Agreement emphasises the need for policy to ensure that change can be achieved efficiently and fairly. The point is also made that 'coherent environmental, economic and social policies are critical and will require commitment at the highest political level'. In commenting on workplace issues the report emphasises the inclusion of social reform and the goal of a just transition in the policy framework for a low carbon economy. It defines a just transition as 'a new mode of production and consumption that allows for greater social inclusion, equity and opportunity'.

3. Labour market adjustments to the green economy

According to a UNEP study on green jobs, which are 'jobs in the environmental sector and/or jobs requiring specific environment-related skills', labour markets are expected to be affected in at least five ways as climate change regulation is enforced and the economy is re-oriented toward greater sustainability:

- (i) Additional jobs will be created, such as in the manufacturing of pollution control devices added to existing production equipment.
- (ii) Some employment will be substituted, for example, in shifting from fossil fuels to renewables, or from truck manufacturing to rail car manufacturing, or from land filling and waste incineration to recycling.
- (iii) Certain jobs may be eliminated without direct replacement, for example, when packaging materials are discouraged or banned and their production is discontinued.
- (iv) Many existing jobs (particularly plumbers, electricians, metal workers and construction workers) will simply be transformed and re-defined as day-to-day skill sets, working methods and profiles are greened.
- (v) A fifth potential effect is job migration, as an externality of 'carbon leakage'. However, recent studies show that the impacts of carbon leakage on employment are fairly limited. The OECD has predict-

ed that 'unless only very few countries take action against climate change, carbon leakage rates and competitiveness effect of climate policies are very small' (Martina-Fernandez et al. 2010).

However, the predicted climate change effects on labour markets will vary significantly with time.

In the short term, jobs will be lost in directly affected sectors and new ones created in replacement industries. Jobs will be lost in carbon-intensive sectors, which will grow at a slower pace or possibly contract. New jobs are expected to be created in low-carbon sectors which tend to be more labour intensive than conventional sectors (for example, renewable energy vs. conventional energy). The expected net job creation is likely to diminish as low-carbon technologies become more competitive and technologies mature. As a result, employment gains of this type cannot be sustained over a 10–15 year time span. In addition, due to the reduced mobility of labour and the time it takes to address and reduce skills gaps in emerging sectors, this economic adjustment may cause structural unemployment.

In the medium term, the impact of climate change policy will spread across the economy, creating and eliminating jobs as behaviour changes and value chains adjust. The impact on employment will depend strongly on external factors such as input prices (gas, oil and so on) that determine price differentials between low-carbon technologies and conventional solutions, as well as on the regulatory policies that lead companies to adopt more energy-efficient production practices. The increases in traditional energy prices, along with regulations to price carbon, will improve the competitiveness of renewable energy technologies, leading to employment growth in this sector.

In the long term, innovation and the development of new technologies will create opportunities for investment and growth. It is expected that jobs will be created in the research and development of low-carbon technologies. The results of this research will in turn generate new investment and further job creation in these fields. This virtuous cycle is a clear example of the positive impact that innovation and technological change can have on economic growth and restructuring. However, this also implies that as the green economy grows, there will be increased demand for highly skilled and qualified labour capable of meeting rising technological and innovation demands.

4. Employment trends in environment-related industries

Higher incomes and rising pollution levels have brought with them an increased demand for environmental protection. One result of this is that the EU's eco-industry has an annual turnover of over 270 billion euros, which equals more than 2 per cent of the EU's Gross Domestic Product (GDP). The eco-industry's two most important sectors are pollution management (including technologies and services in waste management, air pollution control, soil remediation and recycling) and resource management (including renewable energy plants and water supply).

The eco-industry not only leads to a cleaner environment, but also contributes to economic growth and employment. The number of people directly employed in the eco-industry is 2.3 million (1 per cent of the European workforce). When induced and indirect effects are included, the eco-industry has a turnover of 750 billion euros and provides 4.6 million jobs. Employment in the EU eco-industry increased by 5 per cent a year in the 1990s, which made it one of the fastest growing sectors in the EU economy. Since 2000, smaller but more dynamic sub-sectors – such as resource management – have been the source of net new employment. This was due to the extraordinary progress made in new technologies, such as solar and wind energy. The size of the more established industries – for example, pollution abatement – has remained fairly constant as these industries met the increased demand by becoming more efficient.

Various definitions of the eco-industry exist. The OECD/Eurostat definition for the eco-industry is all 'activities that produce goods and services to measure, prevent, limit, related to waste, noise and eco-systems. This includes technologies, products and services that reduce environmental risk and minimize pollution and resources.' This OECD/Eurostat definition is also used in a study by Ernst and Young (Ernst and Young 2006), which states that the total direct and indirect employment due to eco-industries represents approximately 3.4 million full-time job equivalents, of which 2.3 million jobs come from pollution management activities. According to this study, the total estimated employment in the eco-industry is as follows:

- 1,845,000 direct jobs in pollution management (solid waste management and recycling, waste water treatment, air pollution control, general public administration, private environmental manage-

- ment, remediation and clean up of soil and groundwater, noise and vibration control, environmental research and development, environmental monitoring and instrumentation);
- 500,000 indirect jobs in pollution management;
 - 1,040,000 direct and indirect jobs in resource management (water supply, recycled materials, renewable energy production, nature protection, eco-construction).

A further study by GHK (GHK et al. 2007) includes all the links between the economy and the environment and therefore covers a much broader range of environment-related economic activities. GHK uses both a core definition and a broad definition. The core definition contains economic activities based solely on natural resources such as organic agriculture, sustainable forestry, renewable energy and water extraction and supply. If this core natural resource definition is applied, taking in the environmental protection and management and environmental quality sectors, total turnover in the environment-related economy in Europe is 405 billion euros and it provides 4.4 million jobs. The broad definition consists of all agriculture and forestry, fishing, mining and quarrying, as well as all electricity generation and water supply and extraction. Based on this definition, total direct turnover is 3 trillion euros and the total number of direct jobs is 21 million.

The conclusion is that, as a result of green economy advancement, even though more than 3 million jobs will be lost in the primary sector and about 0.8 million in manufacturing, more than 20.3 million additional jobs are expected to be created by 2020 in the EU25. Even in areas where employment is projected to decrease, there will be large numbers of job openings because of replacement demand. The need to replace most of the people leaving – due to retirement or other reasons – will more than offset the losses in all areas.

5. Impact of environmental policies on employment

The labour market impact of environmental challenges is reflected in the new EU guidelines for member-state employment policies, which are an integral part of the new Europe 2020 Strategy. For example, Employment Guideline 7 on increasing labour market participation calls on member states to promote ‘job creation in all areas, including green employment’. Guideline 8 on developing a skilled workforce refers to

the need to regularly monitor ‘the performance of up-skilling and anticipation policies which should help identify areas for improvement and increase the responsiveness of education and training systems to current and emerging labour market needs, such as the low carbon and resource efficient economy.’

However, policies need to be coherent, coordinated and enforced to prevent skill bottlenecks from slowing down the green transformation and hampering the development of potential new jobs. Strategic, leadership and management skills that enable policymakers in governments, employers’ associations and trade unions to set the right incentives and create enabling conditions for cleaner production and services are an absolute priority. Environmental awareness, as an integral part of education and training at all levels, introduced as a core skill from early childhood onwards, will eventually push consumer behaviour and preferences and the market itself. Labour market information to make it possible to anticipate and monitor skill needs for green jobs is the critical starting point for effective policy cycles. This enables governments and businesses to anticipate changes in the labour market, identify the impact on skill requirements, incorporate changes into the system by revising training programmes and introducing new ones, and monitor the impact of training on the labour market. Effective coordination between line ministries and social partners will be important, to be achieved by creating task forces for human resource development for a greening economy, or by incorporating training and skills issues into a council for environmental development.

Policies aimed at greening the economy entail a substantial degree of labour reallocation. In turn, this will require appropriate labour market policies that address mismatches between the demand and supply of employment and skills, facilitate transitions and foster the direct and indirect creation of jobs. Positive employment effects can be expected in the form of direct and indirect job creation in specific sectors and areas, such as clean energy, environmental resource management, energy and material efficiency, environmental services, cleaner production and diversification. However, there will also be a substantial redistribution and reallocation of jobs between, as well as within sectors. In fact, OECD evidence suggests that job flows between firms in the same industry are an order of magnitude greater than sectoral reallocation (OECD 2010). Furthermore, as new technologies are often diffused via the displacement of existing firms by innovative start-ups, the acceleration of eco-in-

novation and the diffusion of green production technologies will further intensify these within-industry flows. OECD work also shows that the employment impact of green growth will be uneven across geographical areas. Although localities that have specialised in what will eventually become declining sectors – for example, fossil fuel production – will face the challenge of developing new specialisations, green growth will also provide new opportunities for local economic development. Many workers in declining regions and sectors may require public assistance to relocate or acquire new skills, however.

Employment levels and structures will be affected not only by policies aimed at environmental sustainability, but also by the need to adapt to climate and other environmental changes that are already happening. These may become worse in the future, depending on the degree and success of mitigation strategies. On the one hand, climate and other environmental change may destroy certain production factors – for example, farm lands, tourist resorts and fish stocks – and disrupt production processes (for example, through hurricanes and flooding), leading to the reallocation of labour and capital across and within sectors and regions. On the other hand, climate change can create new job opportunities as new markets emerge in specific sectors or regions and investments are made to cope with the changing environment. It should be borne in mind, however, that the capacity for effective adaptation is limited and likely to entail, from a certain point onwards, very high social, environmental and economic costs. So far, there have been only a limited number of studies of the quantitative impacts on output and employment of adaptation to climate change, but the scale of labour market adaptation should not be underestimated. The areas that are expected to undergo the most significant adjustments in employment, in terms of both level and composition, include agriculture and fisheries, beach and skiing tourism, infrastructure building, energy supply, construction and finance and insurance. The regions most likely to be affected are thought to include Southern Europe, the Mediterranean Basin, mountainous areas, coastal zones, densely populated floodplains and the Arctic region.

The policy issues mentioned above are a key aspect of job quality, in particular when it comes to access to training and lifelong learning opportunities. There are, however, additional issues related to job quality that will be affected positively or negatively by environmental change and/or policies aimed at greening the economy:

- Health and safety at work: on the one hand, measures aimed at promoting environmentally friendly workplaces can help to improve working environments. For example, natural ventilation can both reduce energy consumption and improve air quality at the workplace. On the other hand, more extreme climate change can lead to more difficult work conditions in certain occupations, for example, outdoor workers in construction or agriculture.
- Gender equality: structural change resulting from greening the economy can affect the gender balance of employment. For instance, several strongly male-dominated sectors, such as fossil-based energy production and extraction of oil and gas, are likely to suffer most from job losses. At the same time, potential positive employment effects may arise in other, also typically male-dominated areas, such as infrastructure investments in green energies and resource efficiency.
- Sustainability of job creation: not all employment gains in green sectors will be permanent. While some green technologies may initially have a higher than average labour intensity, differences in labour intensity are likely to diminish over time once initial investments have been made, and new green technologies mature and become more productive.

According to an EU Commission Staff working document (European Commission 2005), two policies in particular are seen as likely to have a positive impact on employment; the environmental tax reform and the promotion of environmental technologies. When the EU Climate Package was launched by Commission President José Manuel Barroso in January 2008, he stated that its goals – to decrease CO₂ emissions by 20 per cent by 2020, raise the share of renewable energy sources in the energy mix and develop energy efficiency – could lead to the creation of thousands of ‘new businesses and millions of jobs in Europe’. The Commission’s 2006 renewable energy roadmap confirms this, declaring that there will be 650,000 jobs in the sector by 2020. However, studies undertaken by the OECD and many other sources tend to argue that environmental policies have only a neutral or a slightly positive impact on employment and that no consistent examples of job losses or regional difficulties caused by environmental policies exist. The GHK study mentioned above suggests that the effects of environmental policies will be positive (at least in the short term) due to the boost in demand they cause in labour-intensive industries.

Short-term policymaking should focus on identifying skills gaps in the local, regional, national or sectoral contexts and on that basis take suitable and efficient measures. Identifying skills gaps in the sectors key for sustainable development is also an effective way to achieve good results. Although broad-based awareness-raising (educational) policies are beneficial (especially in making future employees and employers aware of the environmental skills that will be necessary to succeed in the workplace of the future), concrete measures matter more. It is crucial to bring the skills-base up to date with the process and technology-driven adaptations that make for a greener economy, in conjunction with creating real employment opportunities, generating career prospects in the green economy and providing real incentives for developing appropriate environmental skills.

6. The need to up-skill the workforce

As governments and industry increase their efforts to take advantage of the economic opportunities provided by the low-carbon economy, the need to ensure there is a workforce with the skills required to exploit those opportunities becomes more pressing. The EU suffers from systemic weaknesses in its skills base, which limit its productivity and competitiveness in today's economy and reduce its capacity to exploit the opportunities offered by green growth. These deficits in management skills and technical job-specific skills (many of which are related to science, technology, engineering and mathematics – 'STEM') are a greater concern than shortages of new green skills.

The right skills for green jobs are required to make the transition to the green economy happen. Today, skills gaps are already recognised as a major bottleneck in a number of sectors, such as renewable energy, energy and resource efficiency, renovation of buildings, construction, environmental services and manufacturing. The adoption and dissemination of clean technologies requires skills in technology application, adaptation and maintenance. Renewable energies is the sector that has the greatest potential for green jobs creation. Skills are also crucial to enable economies and businesses, workers and entrepreneurs to adapt rapidly to changes as a consequence of environmental policies or climate change.

It has been argued that there is currently no standard in place for a 'green job'. The transformation of skills required to adapt to new tech-

nologies and to undertake environmentally related jobs might push in the direction of creating such standards in the near future. However, in order to define the new skills, common methodologies and benchmarks are needed to assess energy consumption and the minimum energy performance requirement.

The shortage of competent personnel is particularly acute at local level in the EU member states. Local chambers of commerce and vocational training centres should be instrumental in overcoming this bottleneck. Setting up networks of regional training centres, coordinated nationally to create synergies and disseminate best practices, would improve inputs for course design and mobility of workers between regions. In the future, every job will be a green job, contributing – to varying degrees – to the continuous improvement of resource efficiency. Understanding the environmental impact of an occupation needs to be mainstreamed into education and training systems. Integrating sustainable development and environmental issues into existing qualifications is much more effective than creating new training standards. In addition, new green jobs need to have lifelong career prospects, rather than being limited until the end of a given subsidised period. In this respect, the EU should be urged to improve its lifelong learning programmes and the European Social Fund to include green jobs among its priorities.

New skills can drive a green transformation of the labour market in three ways:

- (i) New skills can shift activities in the economy, for example from those that are less energy efficient and generate higher CO₂ emissions towards those that are more efficient and less polluting. This type of transformation occurs at industry level, causing structural shifts in economic activity, and thus in employment, between and within industries. This is called green restructuring. Structural changes in turn decrease demand for some occupations and skill profiles and increase demand for others. An example of this source of change in skill requirements would be the growth of alternative and renewable energy sources, such as wind or solar power, and the relative decline in the production and use of fossil fuels. It calls for training to enable workers and enterprises to move from declining to growing sectors and occupations.
- (ii) Structural changes, the introduction of new regulations and the development of new technologies and practices will result in the

emergence of entirely new occupations. This process is very much country specific. For example, a solar technician is often mentioned as a new occupation in those countries where solar energy is a new technology. Emerging occupations call for the provision of relevant training courses and the adjustment of qualification and training systems.

- (iii) New skills will be needed by workers in many existing occupations and industries in the process of greening existing jobs. For example, within the automotive industry, workers across a range of jobs – from engineering design to the assembly line – will have to work with new fuel efficient technologies. Also, farmers in many parts of the world will have to adjust to more severe drought conditions, requiring them to learn how to grow new crops or new methods for producing the same crops. This source of change in skill requirements is the most widespread: in fact, it will be pervasive, and calls for a major effort to revise existing curricula, qualification standards and training programmes at all levels of education and training.

The challenge for the EU is to choose policy options that maximise productive and decent work, and the challenge for skills development policy is to integrate environmental awareness and the right technical training for green jobs into education and training. Lack of human and financial resources, unclear mandates for the institutions involved and a lack of awareness of training issues among environmental policymakers are among the obstacles hampering the integration of human resource development into environmental strategies. Moreover, mechanisms for identifying, monitoring, anticipating and providing skills do not usually include representation from environment ministries. Similarly, ministries, agencies and institutions concerned with education and training are typically not involved in developing environmental policies. And even where coordination mechanisms exist for policy design, coordination of implementation is weak.

Although new job opportunities arising from greener production are estimated to offset job losses, those who will get 'green' jobs are not necessarily those who will have lost their jobs in so-called 'brown' industries. Retraining workers and upgrading skills are matters of urgency in facilitating a smooth and fair transition to the low-carbon and green economy. Increased investments in green sectors and increased demand for certain occupations may not affect the skills composition of the occupation: for example, demand for railway workers may increase due

to greater investment in public transportation, but the skills needed to perform the job do not change. In such cases it is the number of jobs, and hence the quantity of training required, that may change. This type of skills change, greening existing occupations, is the most widespread and concerns the largest number of jobs.

Effective responses for meeting this current and future demand in skill requirements are as follows:

- Industry-level responses, through such bodies as industry skills councils or chambers of commerce, have already achieved considerable results in several countries. In France, for example, the main federations and business associations in the construction sector launched *Qualit'ENR*, a programme to develop training standards for the installation of renewable energy equipment. Since the creation of the scheme in 2006, training provision has considerably improved.
- At government level, training programmes may be delivered through the formal education and training system, involving ministries of education, manpower or labour and the relevant universities or training centres. Responses can be designed under relevant ministries – such as energy, agriculture, construction and so on – to address national, regional or local demand.
- Public–private partnerships, matching government resources to business's hands-on knowledge of skill relevance and quality, have proven effective in many cases. The involvement of trade unions and employers' associations in education and training through public–private partnerships can deliver effective training responses and trigger green transformation on a larger scale.

7. Green jobs potential in retrofitting the building sector

Retrofitting buildings is widely recognised as the area with the greatest opportunities for employment creation.

Energy efficiency, particularly in buildings and construction, is one of the areas with the most potential for reducing greenhouse-gas emissions, while at the same time creating jobs. According to a UNEP report, some 4 million direct green jobs based on improving energy efficiency already exist across the economy in the United States and in certain European

countries (UNEP 2008). Buildings currently account for less than one million of this total but could represent a future source of many more green jobs. Buildings are responsible for 30–40 per cent of all energy use, greenhouse-gas emissions and waste generation. The construction and renovation of buildings also represents the sector with the highest technical and economic potential for reducing emissions. This conclusion is supported by the Intergovernmental Panel on Climate Change, and also by the McKinsey Global Research Institute (McKinsey 2010). Using current technology, high-performance buildings have the potential to cut energy costs by at least 80 per cent compared with traditional building construction. Jobs in this sector are likely to be performed by people who already work in the building sector, but will be redefined in terms of new skills, training and certification requirements.

In 2009, Vlaamse Confederatie Bouw, a Belgian employers' organisation which represents almost 9,000 construction companies, published a report 'Building the environment and energy: elements for a green construction economy'. This report illustrates that the number of employees within the green construction sector has increased tremendously within this last decade. The prospect for the future is that this increase will be maintained despite the economic crisis. For the construction industry, sustainable building is a growing trend. According to Confederatie Bouw (Jacques De Meester, president of Confederatie Bouw, 2010¹), between 2010 and 2020, 20,000 employees in construction will have a green job. For the future, the builders estimate that the biggest increase will be in low-energy construction and the use of low-energy installations, followed by thermal superinsulation: indeed, they believe the market will double in these three areas by 2020.

A number of European policy measures also affect the construction industry. Through its 'Action Plan on Energy Efficiency' (European Commission 2011) and its 'Energy Performance of Buildings Directive' (European Commission 2010), the EU is seeking to make buildings more energy efficient, reducing energy demand in a way that has greater economic and environmental benefits than costs. Due to the rise in demand for green building components and energy-efficient equipment, green manufacturing jobs will increase. Consider, for example, the thermal re-

1. See: <http://trends.knack.be/economie/nieuws/immo/bouwsector-rekent-op-20-000-groene-jobs/article-1194958166285.htm>

furbishment of buildings: if the highest energy standards are applied, employment will represent 1 million man-years by 2030 (10 per cent of EU employment in the sector). The member states must apply minimum requirements with regard to the energy performance of new and existing buildings, ensure the certification of their energy performance and require the regular inspection of boilers and air conditioning systems in buildings. The EU Directive on the energy performance of buildings was drawn up to aim for this target, laying down a common methodology for calculating the integrated energy performance of buildings, with minimum standards on the energy performance of new buildings and existing buildings undergoing major renovation.

According to the Intergovernmental Panel on Climate Change (IPCC), retrofitting and replacing obsolete equipment in buildings has the largest potential for reducing greenhouse gas emissions by 2030 (Pachauri and Reisinger 2007). Many retrofitting measures can pay for themselves through energy savings and government support for such measures is largely offset by higher tax revenue and lower government social security spending. The most ambitious such programme to date is the initiative by the German Alliance for Work and the Environment, a partnership between the Government, building employers, trade unions and non-governmental organisations launched during a recession in the building sector in 2001. The programme helped to retrofit 342,000 apartments with improved insulation of roofs, windows and walls, along with advanced heating and ventilation systems and installation of renewable energy equipment. Over the period 2001–2006, 5.2 billion US dollars in public subsidies stimulated a total investment of 20.9 billion US dollars, creating or maintaining about 140,000 jobs. The scheme reduced the annual emissions from buildings by 2 per cent. About 4 billion US dollars of the government input was recovered through tax and lower unemployment benefit expenditure. In 2005, the government increased funding for the programme to almost 2 billion US dollars a year. This led to an estimated 145,000 additional full-time-equivalent jobs in 2006. Retrofitting of buildings has become one of the key elements of the German government's strategy to reduce emissions by 40 per cent by 2020.

Despite these promising developments, the employment potential of green construction must be mainstreamed, particularly at EU member state level. Some member states are moving faster than others to rectify this, with France launching its recent mobilisation plan for green jobs and the UK government recently launching a consultation exercise, en-

titled 'Meeting the low carbon skills challenge' (UK Government 2010b). A study of 10 new EU member states projected that 50,000 to 185,000 jobs would be created by retrofitting existing residential building stock.

- In France, in 2006, partial retrofitting activities in buildings accounted for 9,700 jobs (operations) and buildings accounted for 9,700 jobs (operations) and 7,150 jobs (related material production), likely to grow to 21,000 and 15,000 by 2012. The French Grenelle Plan-Batiment required that by 2012 all new buildings would be low power and by 2020 they would all be 'positive energy'. It planned to progressively scale up to renovate 400,000 units in 2013 and 800,000 houses using the most energy by 2020.
- Germany set very ambitious targets to renovate existing residential stock. Its objective was to drive down energy consumption in buildings through installation of insulation, installing modern heat diffusion devices and installing technology to manage energy usage. Its targets were:
 - renovate 300,000 apartments per year;
 - create/preserve 200,000 jobs;
 - reduce emissions by 2 million tonnes per year;
 - reduce public debt by 4 billion US dollars by reducing unemployment and increasing tax revenue.
- In Hungary, a study demonstrated that a large-scale renovation programme could create up to 131,000 net new jobs by 2020.
- The United Kingdom's approach is reflected in its 2050 Pathways Analysis (UK Government 2010b) that evaluates the choices that will have to be made over the next 40 years. The plan for workplaces and jobs encourages businesses to become low carbon emitting businesses internally and, as the providers of goods and services to a low carbon market place, externally. It proposes that the education system support the workplace by teaching the skills needed for the emerging low carbon businesses.

According to the EU member states, building renovation is one of the areas with the highest potential to reduce greenhouse gas emissions and to create decent green jobs in the process. However, in order to fully realise the potential of green jobs creation in the building renovation sector, a number of objectives need to be realised. The EU needs to promote a construction labour market and social policies that are consistent with the green economy, while anticipating the need for new skills, better working conditions and scaling up investments in sustainable sectors.

Investment in skills development for green jobs in the building sector is a vital condition for the successful greening of construction enterprises in the EU, especially in the face of changing technologies and work processes in the industry. Future trends in the building sector can be summarised as follows:

- Higher-skilled, higher-paying employment will arise due to energy-efficient equipment.
- Jobs are likely to be performed by workers who already work in the building sector. However, these jobs will be redefined in terms of new skills, training and certification requirements.
- Potential will arise for highly skilled researchers and engineers. Extensive training is needed in four main areas: diagnostic techniques, knowledge of renewable energy, installation and organisational skills (for example, town planning).
- Means and techniques will emerge to improve working conditions across the EU, such as social dialogue, collective bargaining and collective agreements with builders and construction workers' federations.

8. Concluding remarks on the influence of environmental factors on employment

The transition to a low-carbon economy and its implications for local labour markets requires a multi-dimensional analysis that goes beyond traditional sectoral thinking. The public sector must work in partnership with unions, the business sector, the education sector and other local institutions. This is also reflected in the multiplicity of possible approaches that can be taken when designing public action strategies to manage the transition and enable green growth.

Policy approaches must vary according to target group:

- The sectoral approach: targets specific industries, such as renewable energy, construction or automobiles.
- The approach by type of employer: targets specific types of employer, such as large businesses, SMEs or the public sector.
- The territorial approach: targets specific territories and may be implemented on a variety of scales (local, national, regional), but all levels need to apply relevant knowledge and coordination. Partner-

ships have an important role to play in coordinating intervention and ensuring that priority needs are met.

- The consumer approach: targets the final consumer, notably through habits and preferences. This would be particularly important to stimulate cleaner demand (consumer) that will result in the supply (industry) of cleaner products and services in the market.

To sum up the impact of the green transformation on the labour market:

The profile of green jobs needs to be understood. This is an important sector: in its broadest definition, it concerns up to 21 million jobs in Europe linked to the environment. Green jobs are broadly ‘jobs in the environmental sector and/or jobs requiring specific environment-related skills’. The majority of these are in activities depending on or using natural resources rather than employment in environmental management (pollution and resource management). It is therefore important to ask about the skill profiles of these jobs and how skills needs might change in the future, although data on skill profiles in the green economy are scarce.

Green jobs pay off through improved productivity. Green jobs are essential for European economies as they make it easier to innovate, adopt new technologies, attract investment and compete in new markets. This consequently increases job growth and productivity. However, the ETUC has drawn attention to the risk that unless the transition is properly managed jobs in new enterprises favoured by climate policies will be less well-paid and enjoy less secure conditions of employment than in established branches (ETUC 2007).

Skill shortages are a threat to green expansion. A number of sectors already face shortages. Recognising this challenge, the Directive on the Energy Efficiency of Buildings promotes combined environmental and training measures. According to several national trade unions there is already a shortage of skilled people in this field, meaning that there will not be enough qualified workers to implement the Directive. The call for Europe to put more effort into anticipating changing skill needs is emphasised by the re-launched Lisbon Strategy, as well as by other policy documents. According to the UNEP and the ILO, the transition to a green economy will create demand for workers and there is clear proof that a high share of future green jobs will be high skilled (and thus well paid). It is believed that training programmes will be needed to fill the

new positions. Identifying the skills needed for green jobs may increase capacity to combat climate change. Investment in skills is also needed to make the most of sustainable production and consumption and new environmental technologies, both of which may promote high-skill jobs at the expense of low-quality jobs.

Green jobs can be developed and can lead to new competences. Lifelong learning and vocational training will help to solve these skills shortages, as employees gain the skills needed to adjust to the changing economic conditions and job profiles. According to statistics from Eurostat, workers in environment-related sectors undertake relatively less lifelong learning. Policymakers can ensure that training for green skills is provided and indeed there are already a number of such schemes in place, although there is little information on their effects and on best practices to be copied.

9. Policy recommendations

Many issues arise from the review of the literature and the corresponding analysis to formulate recommendations for policy action. Although the focus of the discussion in this chapter has been the influence of the green economy on the labour market, it was also demonstrated that outcomes are dependent on factors deriving from the enabling policy environment, regulation, economic activity and innovation. The main recommendations of this chapter can be summarised as follows:

- Social partners and trade unions have an important role to play in developing green job potential, in terms of contributing to the decision-making process and in raising public awareness. EU member states and the social partners should include essential environmental issues in social dialogue, at all levels of consultation.
- The EU Commission and the member states should launch information and public awareness campaigns on developing green and decent jobs in a sustainable economy, addressing priority sectors such as buildings and construction.
- Existing and proposed EU environmental legislation has significant potential to create new jobs in areas such as air, soil, water, energy, public services, agriculture, transport, forestry, renewable energy generation and environmental management. These are all sectors that would benefit from green job creation.

- A stable, long-term and ambitious regulatory framework is required for achieving the full potential of green employment. The Commission and the member states should lay down environmental standards and financial incentives creating reliable conditions for at least 10 years, thereby establishing certainty for green job creation.
- Existing financial instruments, including the Structural Funds, the Cohesion Fund and fiscal incentives, should be used to help construction SMEs towards green employment policies and ensure green innovations and production. Member states using the European Social Fund should invest in skills, employment, training and retraining to create more and better jobs through national, regional and local projects, specifically those addressing the building sector.
- EU member states should incorporate the concept of sustainability into basic guidelines dealing with training, education and lifelong learning, giving all affected workers the right to take part in training and lifelong learning schemes.
- Member states must adapt their education systems and also devise and implement targeted action plans for retraining workers in sectors such as the building sector which will be affected by the transformation towards a new sustainable economy, to ensure that they have access to new and sustainable jobs and that the workforce will be able to adjust their skills to the labour-market needs of a more sustainable economy founded on competence-based training concepts.

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