Sustainable development, green growth and quality employment

Realizing the potential for mutually reinforcing policies

Background paper for the Meeting of G20 Labour and Employment Ministers

Guadalajara, 17–18 May 2012

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Executive summary

This paper, jointly prepared by the ILO and the OECD, reviews the main short-term and longer-term implications for the labour market of a transition towards sustainable development and green growth and highlights the main policy challenges for labour market and training policies. It is meant to provide background information for the discussions of the G20 Labour and Employment Ministers at their meeting in Guadalajara, Mexico on 17–18 May 2012. The main insights of the paper are as follows:

- A successful transition towards a low-carbon and resource-efficient economy will necessarily reshape the labour market significantly, opening new opportunities for decent work.
- The relationship between sustainable development, green growth, decent work and good labour market performance can be mutually reinforcing, as illustrated by a growing number of examples:
  - Government initiatives to promote the expansion of renewable energy have increased employment opportunities in the energy sector, and employment in the renewable energy sector is projected to continue to grow at a rapid pace in the coming decades.
  - Government incentives to improve the energy efficiency of buildings are playing an important role in generating employment, including in the current weak recovery context in a number of G20 countries.
  - Carefully designed policy packages, such as environmental tax reforms, which use the revenues from newly imposed environmental taxes to lower taxes on labour income, can play an important role in making environmental, employment and social policies mutually reinforcing.
- Nonetheless, the environmental policies required to foster a transition towards green growth will not always promote more and better quality employment. In particular, the transition to clean and efficient energy will entail adjustments to the labour market with gains and losses in employment and changes in skills requirements and occupational profiles:
  - The transition is very likely to result in declining employment in fossil-fuel sectors, such as coal mining. This will involve potentially large adjustment costs for the workers, firms and regions dependent on these sectors.
  - As new green jobs are created and existing jobs are transformed to become greener, many workers will need additional training and governments will need to prevent skill bottlenecks from becoming a barrier to achieving green growth.
- Labour market and skill development policies, together with social dialogue, have an important role to play in promoting a just transition towards sustainable development and green growth.
- Since this transition will create both new opportunities and new risks for workers and their families, labour market and skill policies can maximize the new opportunities for workers, especially those most in need of better employment opportunities, while minimizing unavoidable adjustment costs and assuring that they are shared in an equitable manner.
- Four areas in which policy action may be particularly important are:
  - Meeting the emerging job-skill requirements of a greening economy;
  - Helping workers to move from declining firms and sectors to growing firms and sectors, while providing income security;
  - Assuring worker rights in growing green sectors, while seizing opportunities to promote social inclusion;
  - Strengthening labour market information systems and social dialogue so as to promote a deeper shared understanding of how best to green the labour market.

Introduction[1]

It is now widely recognized that it is essential to decouple economic growth from unsustainable environmental pressures, such as those leading to global climate change. While the world's population has increased by over 3 billion people since 1970, the size of the world economy has more than tripled. This growth has pulled hundreds of millions out of extreme poverty. However, this growth has been unevenly distributed and achieved at significant cost to the environment. Future economic growth with decent work and rising living standards will critically rest on our ability to manage and restore the natural assets on which all life and economic activity depend. Failure to do so will have serious consequences, especially for the poor, and ultimately undermine the economic growth and human development prospects of future generations. For example, pollution and the overuse of depletable resources (soil, water, forests, and fisheries) will cause rapidly rising costs, while higher concentrations of greenhouse gases (GHGs) in the atmosphere will entail considerable further costs in terms of output and aggregate productivity levels. Living standards will be significantly affected.[2]

A successful transition towards a low-carbon and resource-efficient economy will necessarily reshape the labour market. It follows that labour market and skill development policies, together with social dialogue, have an important role to play in promoting a fast and efficient transition towards sustainable development and green growth. Since this transition will create both new opportunities and new risks for workers and their families, labour market and skill policies must also assure a just transition by maximizing the new opportunities for workers, especially those most in need of better employment opportunities, while minimizing unavoidable adjustment costs and assuring that they are shared in an equitable manner.

This paper begins with a short discussion of the relationship between green growth and good labour market performance, emphasizing the importance of finding win-win policy approaches that promote both of these critical policy goals. Attention then shifts to analysing the main impacts of green growth policies on the labour market. Finally, the note discusses how labour market and education/training policies can best contribute to a fast, efficient and just transition towards inclusive green growth in the G20 countries. Throughout, the aim is to identify key policy issues that labour market authorities would need to address in the context of a transition towards environmentally sustainable growth, rather than to provide definitive guidance for making policy choices.

1. The relationship between sustainable development, green growth and labour market performance

The relationship between sustainable development, green growth and good labour market performance can be mutually reinforcing, but this is not automatic. There are a growing number of examples illustrating how progress in these areas can be mutually reinforcing. For example, government incentives to improve the energy efficiency of buildings play an important role in generating employment, including in the current weak recovery context. Similarly, government initiatives to promote the expansion of renewable energy – including green fiscal stimulus measures enacted in response to the recent financial and economic crisis – have expanded employment opportunities in the energy sector.

Nonetheless, it has to be recognized that the environmental policies required to achieve green growth will not always promote more and better quality employment. In particular, the transition to clean and efficient energy will entail adjustments to the labour market with gains and losses in employment and changes in skills requirements and occupational profiles. For example, the transition is very likely

[1] Much of the material in this paper is drawn from a forthcoming ILO report, *Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy,* and an OECD report to the DG-EMPL of the European Commission, *The jobs potential of a shift towards a low-carbon economy* (Paris, 2012). A shorter version of the latter will appear as a chapter in the forthcoming 2012 edition of the *OECD Employment Outlook.*

[2] See OECD: *OECD Environmental Outlook to 2050* (Paris, 2012) for a detailed analysis of the environmental consequences of continued growth through 2050 without more ambitious policies to manage natural assets with greater care. The report shows that the costs in terms of climate change, biodiversity loss, water quality/access and the health impacts of pollution would be very high, but that achievable solutions exist to reconcile continued growth with good environmental stewardship. Other studies assessing the damages due to environmental degradation include N. Stern: *The Economics of Climate Change: The Stern Review,* (Cambridge, Cambridge University Press, 2007) and W. Nordhaus: *The Challenge of Global Warming: Economic Models and Environmental Policy* (2007).

to result in declining employment in fossil-fuel sectors, such as coal mining. This will involve potentially large adjustment costs for the workers, firms and regions dependent on these sectors. Shifting the energy mix towards cleaner sources of energy – and cleaning up polluting sources of energy, such as with carbon capture and sequestration – will also tend to raise energy costs, at least for a period of time. Higher energy costs are likely to have ripple effects throughout the economy that could depress employment or wage levels in certain sectors (e.g. in the travel industry). By contrast, investments in energy efficiency in buildings, transport and industry can be cost effective, with benefits cumulating over time. In sum, there is no automatic link between cleaner energy and stronger labour market performance, but these goals can often be made to be complementary.

The shift to a greener economy must take into account the distributional effects of changing prices and access to energy. While poorer households consume less energy, they spend a higher proportion of their incomes on energy in both industrialized and developing countries.[3] Thus, an increase in energy prices resulting from high demand, elimination of subsidies or carbon pricing can have a large impact on their household budgets.[4] Conversely, a green economy offers major opportunities for upgrading conditions for a large number of jobs in agriculture, waste management and recycling.

A key role that governments, together with business and labour, can play within a comprehensive sustainable development strategy is to maximize the potential complementarity between environmental goals, employment and social policy goals. There are policy packages (combining market-based instruments, regulatory instruments, voluntary initiatives and information-based instruments) that can produce environmental gains while also generating a growth dividend by reducing pre-existing inefficiencies in the economy. Environmental tax reform is a particularly important example of such a win-win policy package: taxing CO_2 emissions or other types of environmental damage provides an incentive for environmental improvements even as it provides a new stream of public revenues that can be used to promote higher employment (e.g. by reducing the taxation of labour income). Revenue from environmental taxes can also be recycled so as to encourage the development of new energy-efficient technologies and activities, an approach that may be particularly appropriate in developing and emerging economies.

1.1 Shifts in employment will occur within and across enterprises and industries

The transition toward sustainable development/green growth will be an important driver of structural change across the entire economy. Labour markets will be reshaped as the mix of goods and services produced and consumed shifts away from activities with a large environmental footprint and greener technologies are developed and applied throughout the economy.

The impacts on employment will include: (i) the net impact on employment (i.e. the balance between job gains and job losses resulting from green structural change); (ii) the movement of workers from declining to growing firms and sectors (labour re-allocation); and (iii) the transformation of jobs that are neither lost nor gained but are adapted to meet the requirements of a greener economy. For certain workers, e.g. low-skilled workers and those in single-industry communities, the job transitions implied by these employment shifts will often be very difficult. While all three types of employment adjustments will affect economies at all levels of development, important differences are likely to emerge in the form that these adjustments will take and in their intensity.

1.2 Working definitions of "green"

It is important to find agreement on working definitions of "green policies", the "green economy" and "green jobs" so as to allow different studies to be compared and the impacts of environmental policies to be assessed. Determining an accepted definition of a "green job" is an ongoing task calling for further analysis and discussion (see box 1 for a discussion of different approaches to defining and counting green jobs). However one delineates the specific industries or tasks that define a green job, fundamentally a green job should be understood as

[3] T. Jamasb and H. Meier: *Energy spending and vulnerable households,* Electricity Policy Research Group Working Paper 1101. Cambridge Working Papers in Economics 1109 (Cambridge, EPRG, 2010).

[4] Sustainlabor Foundation: *Developing renewables – Renewing development. Towards clean, safe and fair energy,* (Madrid, 2008), available at http://www.sustainlabour.org/documentos/EN161-2008.pdf

Box 1. Defining and counting green jobs: A work in progress

Several definitions of green jobs have been proposed in the literature, but thus far no consensus has emerged. Most statistical definitions take an industry approach, identifying green jobs with employment in industries that are judged to produce green products and services with variations in scope and thresholds.

Two definitions have been proposed at the international level:

- Building on the 1999 OECD/Eurostat definition of eco-industries (i.e. industries producing environmental goods and services, such as pollution – and resource – management industries), Eurostat has developed a relatively narrow definition which implies that green jobs account for 2 per cent of total employment in the EU area.[1] The US Commerce Department has implemented a similar approach and concluded that green jobs accounted for between 1.5 per cent and 2 per cent of total US employment in 2007.[2]
- The United Nations Environment Programme (UNEP) and the ILO developed a broader industry-based definition of green jobs in 2008 according to which green jobs are decent work contributing directly to reducing the environmental impact of economic activity, ultimately to sustainable levels.[3] This definition includes employment in green sectors as well as green occupations across the economy. It also encompasses employment in industries that are heavily dependent on environmental resources (e.g. agriculture, forestry) and environmental quality (e.g. environment-related tourism), even though many firms in these environmentally-dependent sectors do not operate in an environmentally friendly manner.

A growing number of national governments are developing their own definitions of green jobs to serve as a basis for collecting statistics and making policy choices. For example, 10 of the 27 countries responding to an OECD questionnaire on green jobs indicated that they have adopted a definition of green jobs, while 5 are in the process of developing a definition. These national initiatives have often been guided, at least in part, by the international standards mentioned above, but have also incorporated novel aspects, as is illustrated by ongoing work in the United States to develop statistics on green jobs:

The US Bureau of Labor Statistics is using two different approaches to measuring green jobs: (i) an *output approach,* which identifies business establishments that produce green goods and services (GGS), estimates the GGS share of their total sales and then counts that same proportion of all jobs in these establishments as green jobs; and (ii) a *process approach*, which identifies business establishments that use environmentally friendly production processes and practices, regardless of the nature of the good or service they produce, and counts the jobs associated with these processes as green jobs. Estimates implementing the first approach have recently been released and they indicate that 2.4 per cent of total employment was "green" in 2010.

While these initiatives have been instructive, a harmonization of concepts would make it easier to compare developments in different countries. Accordingly, the ILO is working on the development of a statistical definition for green jobs and on guidelines for statistical measurement of employment in the context of a green economy. In October 2013, the ILO will host the 19th International Conference of Labour Statisticians (ICLS), where it will present a concept paper which reviews current practice in selected countries and suggests a standardized definition that could be applied by countries in all regions and at all stages of economic and social development.

[1] European Commission: *Employment in Europe 2010* (Brussels, 2010).
[2] US Department of Commerce: *Measuring the Green Economy* (Washington, DC, 2010).
[3] For more information, see http://www.bls.gov/green/.

one that both contributes to reducing the environmental footprint of the economy and meets the criteria for decent work.[5]

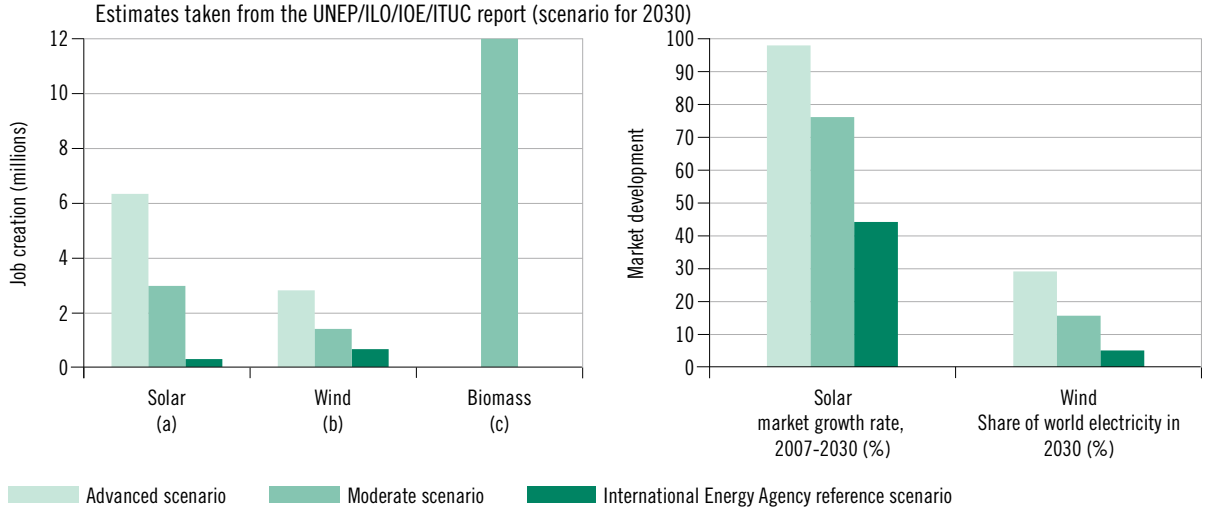
[5] "Decent work conditions" refers to adequate wages, safe working conditions, basic social protection, respect for workers' rights and a process of social dialogue. See, for example, International Institute for Labour Studies (IILS): *Defining "green": Issues and considerations,* Discussion paper (Geneva, ILO, 2011), available at http://www.ilo.org/public/english/bureau/inst/research/ecinst/publications.htm; or UNEP/ILO/IOE/ITUC: *Green jobs: Towards decent work in a sustainable, low-carbon world,* (Nairobi, UNEP, 2008); or US Bureau of Labor Statistics: "Measuring green jobs" (Washington, D.C., 2010), available at http://www.bls.gov/green/#overview.

1.3 Significant job-creation potential in renewable energy sectors

Demand for certain types of green workers will have to grow rapidly if the transition to green growth is to succeed. Policy-makers should attempt to anticipate recruitment and skill bottlenecks that would hinder the transition, while assuring that disadvantaged groups are able to benefit from these new employment opportunities. An increasing number of studies highlight the large potential for job creation associated with the expansion of renewable energy

Figure 1. Projected global job creation and market development in the renewable energy sector by 2030

Estimates taken from the UNEP/ILO/IOE/ITUC report (scenario for 2030)



a) Underlying assumptions (European Photovoltaic Association and Greenpeace International, 2007, p. 48): 10 jobs are created per megawatt (MW) during production; about 33 jobs per MW during the process of installation; wholesaling of the systems and indirect supply (for example in the production process) each create 3–4 jobs per MW; and research adds another 1–2 jobs per MW. Over the coming decades, it can be assumed that these numbers will decrease as the use of automated machines will increase (especially for jobs involved in the production process).

b) Underlying assumptions (Global Wind Energy Council and Greenpeace International, 2006, p. 46): 16 jobs are created for every MW of new capacity through manufacture and component supply; a further 5 jobs by wind farm development, installation and indirect employment; and 0.33 jobs for regular operations and maintenance work at wind farms. As production processes are optimized, the number of manufacturing jobs falls to 11 jobs for every MW of cumulative capacity by 2030.

c) Estimates based on various studies, for different countries and areas.

Source: UNEP/ILO/IOE/ITUC (2008).

generation and distribution.[6] After an extensive review of available studies, a groundbreaking report by UNEP, ILO, IOE and ITUC estimated that about 2.3 million people were employed worldwide in the renewable energy sector in 2006.[7] While the majority of these jobs are in developed countries, developing and emerging economies have also undertaken large-scale initiatives. UNEP updated its estimate of worldwide employment in durable energy to more than 3 million workers in 2009,[8] while the ILO estimates that 4.3 million are currently employed either directly or indirectly by the renewable energy sector.[9] While this number is growing rapidly, it is still a tiny share of total employment. China has the largest absolute number of workers in renewable energy (1.1 million), but that represents only about 0.1 per cent of total employment. The employment share of renewable energy is somewhat higher in a few EU countries (e.g. 0.7 per cent in Germany).

Employment growth in the renewable energy sector is projected to be rapid in the coming decades (figure 1). The UNEP report suggests that by 2030 about 20 million jobs could be created worldwide: 2.1 million jobs in wind energy production, 6.3 million in solar photovoltaic and 12 million in biofuels-related agriculture and industry. Similarly, a 2009 study for the European Commission estimated that achieving the EU target for the share of renewables in total energy consumption to attain 20 per cent in 2020 could create more than 2 million jobs, while a 2010 study in the United States estimated that implementing a 30 per cent renewable portfolio standard, together with aggressive energy-efficiency measures, would expand US employment in the energy sector by 4 million jobs in 2030. However, it must be borne in mind that these estimates represent only the potential for gross job creation within the renewable energy sector because they do not net out the associated job losses in the fossil-fuel energy sector and possibly elsewhere in the economy.

More comprehensive studies of the restructuring of the energy sector towards a cleaner energy mix show that *net* employment gains will result for energy-related activities, even after taking account of the jobs lost in more polluting energy sectors, because the renewable energy sector is more labour-intensive and thus requires

[6] Similar, but generally less detailed analyses, have been conducted for a number of other green sectors (e.g. green ICT and green construction), or recent green policy initiatives (e.g. green fiscal stimulus packages enacted in response to the 2008–09 recession, and longer-run green jobs initiatives such as the "Grenelle de l'environment" goals in France).

[7] UNEP/ILO/IOE/ITUC, op.cit.

[8] UNEP: *Towards a green economy: Pathways to sustainable development and poverty eradication, Part II: Investing in energy and resource efficiency* (Nairobi, 2011).

[9] ILO, forthcoming, op. cit.

more jobs per megawatt of energy produced than the fossil fuel-based energy sector. It needs to be emphasised, however, that these are still partial equilibrium studies that do not capture the full macroeconomic impact of environmental policies on employment. In particular, no account is taken of how rising energy prices affect the transportation and travel sectors.

1.4 Major adjustments concentrated in key industries and sectors

Because the employment and social implications of a transition to a green economy are strongly influenced by economic structure and sectoral composition, it is critical to examine green policies on a sectoral case-by-case basis.[10] The key challenge is to develop a practical interpretation of environmental sustainability for each of the main sectors supported by policy-makers, social partners and other main stakeholders. The process of defining this is likely to draw on national policies and priorities as well as international benchmarks. [11] Some of the principal employment implications for specific sectors are summarized in the Annex.

Sectoral case studies have also highlighted how skills shortages have emerged as a bottleneck for the green economy.[12] Too little is known about how the switch to greener technologies will alter job-skill requirements across the economy. Sectoral case studies – both of "green" sectors that are likely to grow rapidly and carbon-intensive sectors that will need to radically change their technologies or shed jobs in the transition towards green growth – are helping to fill this gap.

1.5 Carbon-intensive sectors will face strong adjustment pressures

Case studies of industries with a large environmental footprint also provide useful information about the structural labour market changes implied by a transition towards green growth. Emissions are concentrated in a relatively small number of industries with a limited share of total employment. OECD analysis concluded that the 10 most carbon-intensive industries account for nearly 90 per cent of all CO2 emissions but only 14 per cent of employment on average in the European Union (figure 2). These industries include two energy-producing sectors, three transport sectors, three manufacturing sectors, agriculture and mining. The share of employment that the most-polluting industries account for varies significantly from country to country within the EU and is generally higher in countries with lower levels of per capita GDP.

An ILO study estimates for a more diverse group of advanced economies, that 15 industries account for 70 per cent of all emissions.[13] For the several countries that have data available, the share of total employment in the top 15 emitting industries is low. In the United States, for instance, only 8 per cent of all workers were employed in the top 15 emitting industries in 2005. Employment shares that are nearly as low are observed in other countries: in the EU, only 10 per cent of employed persons work in the 15 most polluting industries, whereas in the Republic of Korea and Japan the figures, albeit higher, are still comparably low, at 15 and 12 per cent respectively (see table 1).

Should many workers in these carbon-intensive industries lose their jobs in the transition towards green growth, they are likely to face above-average adjustment costs. Many of these industries employ disproportionately high shares of low-skilled and older workers.[14] Since both of these workforce groups are known to have above-average difficulty in finding new jobs, labour market measures such as training programmes are of particular importance for keeping them in employment. Several of the high-carbon industries are also highly localized, such as coal mining which is often concentrated in rural areas offering relatively few employment options for displaced miners. Not surprisingly, workers in these industries currently display a low level of labour mobility, another indicator they are likely to require assistance should employment decline significantly in these sectors, as appears likely.

1.6 The whole-economy view

General equilibrium and other types of macro-modelling provide a powerful tool for analysing all of the direct and indirect effects of environmental policies on employment. This whole-economy perspective

[10] See A. Jarvis, A. Varma and J. Ram: *Assessing green jobs potential in developing countries: A practitioner's guide,* (Geneva, ILO, 2011).

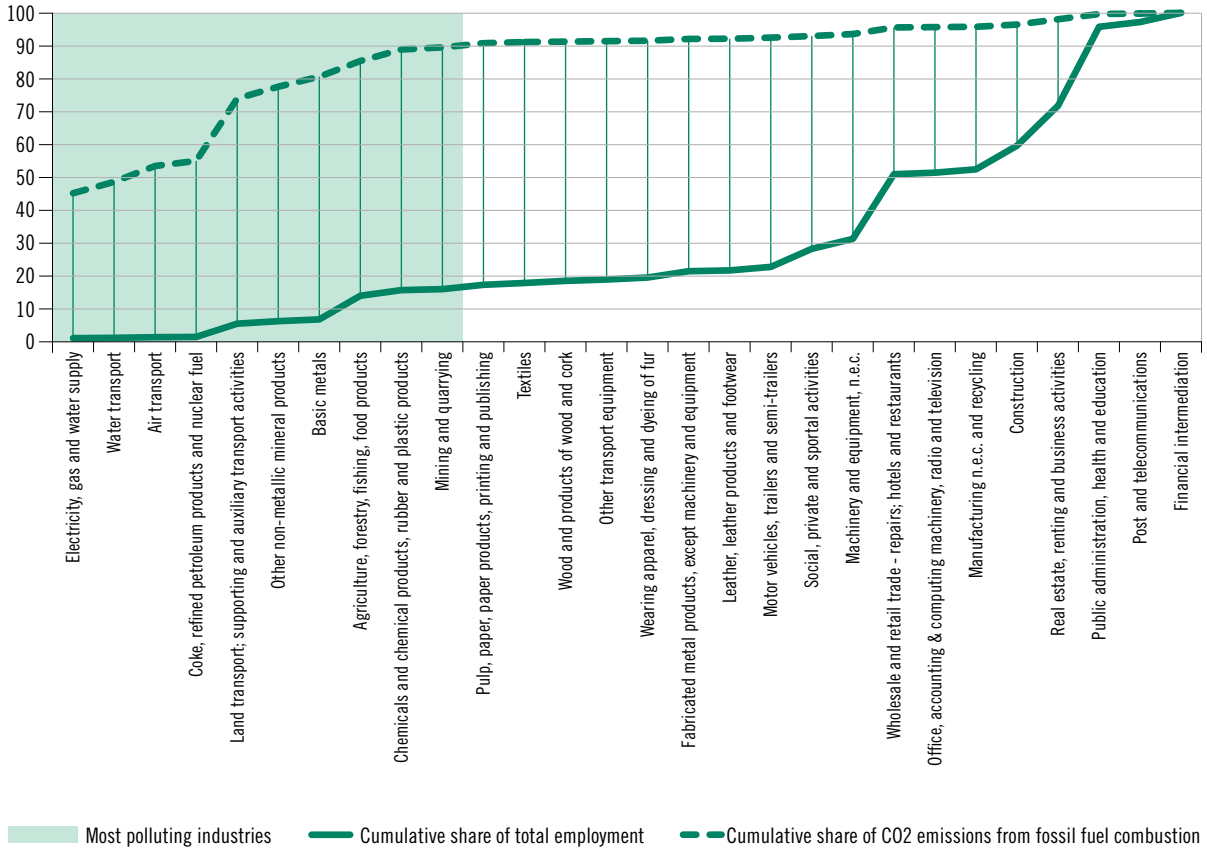
[11] The forthcoming ILO report, *Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy,* covers key trends and issues, including the impact on employment and good practices, in detail.

[12] ILO: *Skills for Green Jobs* (Geneva, 2011).

[13] For example, in the European Union the top four polluting industries are: electrical energy, gas, steam and hot water; coal and lignite; products of agriculture, hunting and related services; and other non-metallic mineral products. See IILS: T*owards a greener economy: The social dimensions* (Geneva, ILO, 2011), p. 13.

[14] Among the countries with skill data presented in table 1, the share of low-skilled workers in total employment of the top 15 CO_2-emitting industries is typically about double their share of all workers employed in these industries.

Figure 2. CO_2 emissions and employment in the EU-25 area in 2005 (percentages)



Note: Averages for the EU-25 region

Source: Employment and value added data from EU-KLEMS, CO2 emissions data from GTAP.

is crucial because indirect effects, such as the impact of higher energy prices on employment across all sectors of the economy, potentially could dwarf the direct effects discussed above.

A forthcoming ILO report reviewing the impact of environmental measures on total employment from 20 studies covering eight different countries plus the European Union shows that a large majority (17) identify a positive or neutral net impact on employment. Positive net impacts were of the order of 0.5 to 2 per cent. Many of the studies included complementary government policies and incentives, including tax credits, subsidies and workers' training and education which could offset any negative impacts on employment of environmental reforms.[15]

Some of the more successful environmental policy mixes aimed at reducing environmental damages

[15] ILO, forthcoming, op.cit.

Table 1. Employment shares and skill level in the 15 most carbon-intensive sectors, 2005

	Share of total employment (%)	Share of low-skilled workers (%)
Australia	12	26
Canada*	23	…
EU**	10	26
France	9	24
Germany	9	34
Japan	12	21
Republic of Korea	15	35
United Kingdom	7	15
United States	8	14

Note: The top high carbon-intensive sectors include agriculture, mining and quarrying, manufacturing, transport. 'Low-skilled' refers to education levels. Therefore comparisons across countries are to be made cautiously. The shares of low-skilled workers are based on the total of hours worked in the economy.

* Employment share data for Canada correspond to 2010.

** Data for employment share is for EU15, whereas the data for the low-skilled worker share is for EU-20.

Source: ILO estimates based on EU KLEMS and national statistics.

while improving labour market outcomes include environmental tax reforms, or ETRs. Both environmental and socio-economic benefits can be achieved – according to the so-called "double dividend hypothesis" – if polluting production factors such as CO_2 emissions are priced appropriately and if the revenues collected from these environmental taxes are recycled to reduce the costs of labour, compensate poor households and invest in new technologies and skills upgrading, for instance.

The OECD has recently made use of its global computable general equilibrium model (the ENV-Linkages model, see box 2) to analyse how ambitious climate change mitigation policies could affect labour market outcomes.[16] These simulations show that a well-designed emissions trading system could achieve sharp reductions in GHG emissions while only moderately slowing GDP growth in the coming decades.

The OECD analysis also confirms that one of the main labour market impacts of mitigation policies will be to alter the sectoral composition of employment, with fossil-fuel industries experiencing the steepest employment declines and renewable-energy industries the sharpest increases (see figure 3). This modelling exercise shows that the intensity of the induced job reallocation varies significantly across G20 countries, being greatest for energy exporters (figure 4). While the OECD modelling work suggests generally small net impacts on total employment, other modelling approaches suggest that certain policy combinations can generate moderate net gains under the right conditions. They also suggest that there is a larger potential for well-designed green growth policies to result in net employment gains in developing economies where much of the labour force is currently underemployed.

The OECD modelling also illustrates how the functioning of the labour market itself could affect the overall cost of sharply reducing GHG emissions and its net impact on total employment. While the impact of mitigation policy on GDP growth is small when the labour market adapts smoothly, it becomes significantly larger when the labour market is characterized by rigidities that cause employment to fall when the pressure for structural change rises. This finding illustrates the importance of combining ambitious environmental policies with measures to increase the adaptive capacity of labour markets or otherwise support strong employment performance. As an example of the latter approach, the modelling shows that the combined effect of introducing an emissions trading scheme and recycling carbon revenues so as to reduce the tax wedge on labour income can generate a so-called "double-dividend" by delivering both lower GHG emissions and higher employment in the presence of rigidities that would otherwise cause employment to fall.

A number of other general equilibrium modelling studies find similar results, including ILO studies using the ILO Global Economic Linkages Model.[17]

2. The role of labour market and skill policies

2.1 The general approach

Labour market and skill policies should play an active role in helping workers and employers to make the transition to sustainable development, green technology and renewable energy. However, it is important to bear in mind that the main policy drivers of green growth will need to be environmental policies, which align economic incentives with environmental responsibility, and innovation policies, which encourage the development of the new technologies that will be required to decouple economic growth from depletion of environmental stocks. Labour market and skill policies can contribute to an overall sustainable development policy strategy by helping to foster the structural changes required to green the economy while lowering the associated social costs and assuring they are shared equitably. Doing so will result in a quicker and fairer transition towards green growth, while also making it much easier to develop and sustain political support for this essential but difficult policy agenda.

Labour market policies and programmes can play a significant role in helping employment adjustments by providing:

[16] The illustrative policy scenario applied in the modelling is an emission trading scheme (ETS) that progressively reduces greenhouse gas emissions over the period 2013-2050, bringing emissions for the OECD area as a whole to 50 per cent below its 1990 level in 2050 (except that emissions in Mexico are assumed to be reduced by 50 per cent in 2050 as compared with the 2005 level, rather than the 1990 level). The target is less stringent for non-OECD countries, where emissions are reduced by 25 per cent in 2050 as compared to what would be observed in these countries in the absence of mitigation efforts, under the so-called business-as-usual scenario. It is assumed that there is OECD-wide trading in ETS permits, but that each non-OECD country operates its separate ETS.

[17] See IILS, op.cit.

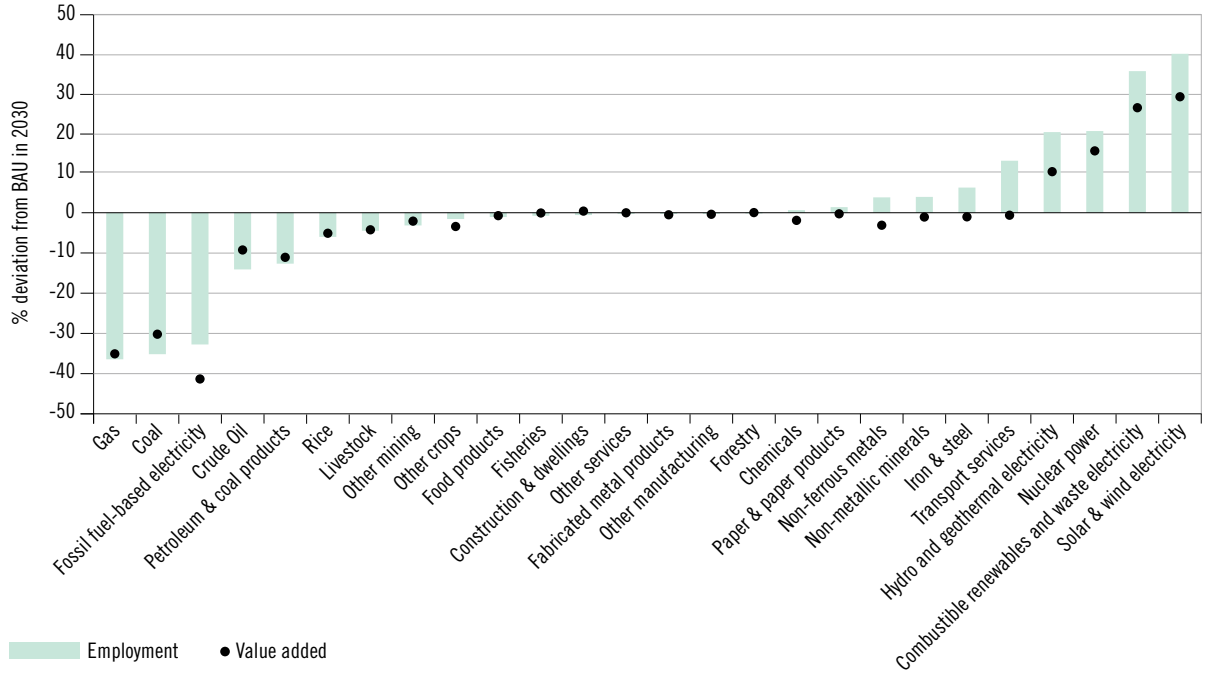
Box 2. Main characteristics of the OECD ENV-Linkages model

The OECD ENV-Linkages model is a recursive dynamic general equilibrium model that has been used extensively for several OECD publications, notably various issues of the *Environmental Outlook*. The model represents the world economy in 15 countries/regions, each with 26 economic sectors, allowing structural changes across countries and regions and within each of them to be studied in detail. The economic sectors include five electric-generation sectors, five that are linked to agriculture (including fishing and forestry), five energy-intensive industries, three sectors linked to oil and gas extraction, refineries and distribution petroleum products, the remaining sectors being transport, services, construction and four other manufacturing sectors. Technological progress is exogenous, but alternative existing production technologies are modelled in great detail in the energy sector and the mix of technologies used evolves in response to changes in relative prices.

The model is built primarily on a database of national economies. In the core version of the model, a labour market-clearing equation equalizes the aggregate labour demand to an exogenous employment level, and therefore determines real wages. However, the model has been augmented to examine what happens when labour markets do not adjust smoothly to the structural changes implied by climate-change mitigation policies. Nevertheless, the model omits many realistic features of labour markets which have a bearing on the labour market outcomes of climate-change policies.

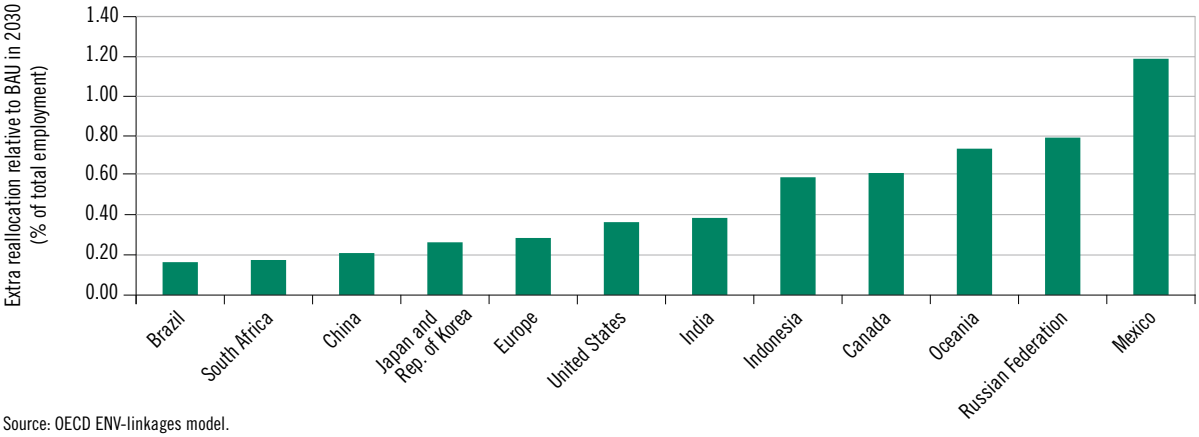
As is the case for most available models developed for the economic analysis of mitigation costs, the ENV-Linkages model has two limitations which tend to overstate the long-run cost of mitigation policies: (i) technological progress is assumed to be exogenous, so that the model does not fully capture the potential effects of environmental policies in stimulating the innovation of new green technologies; and (ii) the model does not fully account for the potential economic damages from climate change and, hence, omits the economic benefits from mitigation policies that operate through reduced environmental disruption. Both characteristics imply that in the long run, potential output and employment gains induced by the mitigation policy are not fully captured in the modelling framework. These limitations are, however, less important when attention is focused on the next several decades, as innovation and climate changes are slow processes, and this is arguably the time horizon that is of greatest relevance for labour market and skill policies.

Figure 3. Simulated changes in sectoral composition of employment associated with an ambitious climate change mitigation policy, OECD
In % deviation from the business-as-usual (BAU) scenario in 2030



Source: OECD ENV-linkages model.

Figure 4. Simulated increase in job reallocation associated with an ambitious climate change mitigation policy, selected countries
In % deviation from the business-as-usual (BAU) scenario in 2030



Source: OECD ENV-linkages model.

- support to enterprises for retaining and/or retraining some workers;
- matching of workers with new jobs;
- prompt identification of skills needs through surveys and other instruments;
- income support measures, such as unemployment benefits, to help limit the downside adjustment process for workers; and
- information to workers on the range of active and passive labour market programmes available to them to minimize disruption.

Efforts to diversify local and regional economies that are heavily dependent on shrinking industries may be needed to allow them to more readily absorb the necessary shifts in labour resources.

While a green transition is not unlike other structural changes, policies and programmes should nevertheless be tailored to address specific challenges and specific industries. The challenge for emerging and developing countries is to address employment adjustments in high-emission industries and, more importantly, to seize growth opportunities based on new technology and clean energy.

2.2 General and green-specific labour market policy measures

In more developed economies, general policies, such as those identified in the OECD Reassessed Jobs Strategy, provide the essential framework for successfully managing the structural changes required to decouple production from harmful environmental effects. In addition to adapting familiar labour market and skill policies so that they better address challenges related to green growth, there also appears to be a role for green-specific policies. However, the role for green-specific measures is likely to emerge only incrementally, as the environmental policy framework needed to support green growth develops and experience with managing the labour market dimension of the transition to green growth accumulates. An OECD questionnaire sent to labour and employment ministries reveals that about 60 per cent of the 27 responding countries have implemented at least one labour market measure targeted on green growth, with training being the most common type of measure. However, most of these programmes are new and quite small. Furthermore, some countries that are leaders in environmental policy, such as Germany and Denmark, are among the 40 per cent not operating any green-specific programmes. This suggests that good general labour market and skill programmes may be adequate in some instances, particularly if they are designed to be responsive to the evolving needs of employers and workers.

2.3 Sound labour market information systems and broad consultations

A first challenge is to better understand and, to the extent possible, anticipate how green growth is changing labour demand and job-skill requirements (see box 3). Many labour ministries are thus extending their labour market information systems to better capture how the greening of the economy is affecting labour markets. For example, both France and the United States have recently published estimates on green jobs based on newly developed surveys. Labour market authorities are also consulting broadly with labour market actors to try and develop a shared understanding of how best to collaborate

Box 3. Early identification of adjustments eases transitions

One of the keys to facilitating this transition for workers will be early identification of affected industries, enterprises and workers, as well as the creation of effective public–private partnerships.[1] In particular, the adjustment for workers is often exacerbated by the fact that: (i) the job loss is unexpected; and (ii) there is little awareness regarding policies and programmes that are available to help them retrain or switch to new jobs. Since a green transformation can be somewhat anticipated, governments, business and labour can work together to identify potential adjustment pressures early, notably regarding skills deficiencies, and develop strategies to ease the transition process. Moreover, public authorities could work closely with vulnerable sectors to inform workers, well ahead of any job separations or layoffs, of the training opportunities and other active programmes that are available to workers. At the same time, efforts will be needed to ensure that the education and training systems are responsive to the development of new technologies, notably in the renewable energy sector.

[1] See ILO, forthcoming, op. cit.

in greening the labour market. These consultations should help to identify strategies to maximise the employment potential of green growth, while also potentially revealing fruitful opportunities for public-private partnerships. A second challenge is to coordinate labour market and skill policies with other green growth policies (e.g. environmental and eco-innovation policies). Doing so is never easy since different ministries are involved and it is often difficult to coordinate across different "policy silos".

The transition toward green growth may also make it increasingly important to incorporate labour market and skill policies into broader sectoral policies, such as initiatives to develop new green sectors or to help existing sectors to become environmentally sustainable. Initiatives in a number of countries to promote energy-efficient construction and retro-fitting illustrate the need to closely coordinate labour market measures, such as the development of appropriate vocational training, with other efforts to develop the market for energy-efficient buildings and certification systems so that customers can identify which firms are able to do this type of work to high quality standards and employers can identify which workers have the skills they require. Training, by itself, is likely to be insufficient to create a market for green building, while subsidies in the absence of adequate training and skill certification run the risk of severe quality control problems.

3. Four areas where policy action may be particularly important

3.1 Meeting the emerging job-skill requirements of a greening economy

The available evidence suggests a significant mismatch between the skills of the workers who will be displaced from declining sectors with a large environmental footprint and growing green sectors. This disjunction will increase the need of mid-career workers for re-training opportunities. However, the greening of existing jobs is likely to affect a greater number of workers. For example, labour-intensive sectors such as construction and agriculture will need to significantly change production methods as they move toward environmental sustainability. Continuing vocational training will be key, but the challenge should be manageable because there appear to be few fully new green skills.

3.2 Assuring a just transition to green growth

While the benefits of a transition towards green growth should be broadly shared, there is a risk that the costs of the transition could fall disproportionately on certain labour force groups, households and localities. One priority for assuring a just transition is to make sure that workers who are displaced from declining firms and sectors receive the help they need to maintain their living standards while reintegrating into the labour market. This is essentially the challenge to reconcile structural adjustment in labour markets with social protection and re-employment services for workers. It is not clear that green-driven structural adjustment calls for different types of policy responses than other types of structural change, but the transition towards green growth makes it more important to meet the "flexicurity" challenge. In emerging and developing countries, a top priority is to introduce or strengthen social protection floors (see box 4).

Box 4. Social protection floors

The value of social protection floors in attenuating the economic shocks to individual households and the wider economy has been well documented.[1] The same mechanisms at work in periods of crisis can also facilitate green transitions, for example by protecting redundant workers as they look for new opportunities or undergo retraining. Income-supporting, passive labour market measures, such as unemployment insurance and pensions, are important elements of a social protection floor, which generally also includes cash or in-kind transfers that ensure access to basic services like healthcare, primary education, housing, water and sanitation. They can be an important part of a package of measures that help the poor in developing countries affected by climate change, addressing energy poverty especially in the context of higher prices.

[1] See Social Protection Floor Advisory Group: *Social protection floor for a fair and inclusive globalization.* Report of the Social Protection Floor Advisory Group (Geneva, ILO, 2011).

Since the spatial distribution of the costs and benefits from green growth will also tend to be uneven, there may also be a role for place-based policies, such as economic revitalization strategies for local economies previously specialised in fossil-fuel production. Workforce development initiatives can play a positive role in such efforts, but generally would not play a leading role.

3.3 Assuring workers' rights in growing green sectors, while seizing opportunities to promote social inclusion

Assuring workers' rights in line with international labour standards in growing green sectors while promoting high-quality jobs is also a key to achieving a just transition. While green growth probably does not call for different types of measures to promote these goals, it will be necessary to be especially vigilant about worker rights, extensive social dialogue and minimum job standards during this period of intense structural change. In the context of developing and emerging economies, it will also be important to assure that emerging green jobs are formal jobs, while existing and currently informal activities, such as in waste picking, are formalised.

The job creation associated with the transition towards a green economy represents an opportunity to promote social inclusion, provided disadvantaged groups in the workforce are assisted to access these new green jobs. Important gains can also be achieved by upgrading existing jobs to decent work with incomes lifting families out of poverty. This could be achieved for tens of millions of smallholder farmers, forest dwellers and informal waste pickers for example. Programmes in a number of G20 countries demonstrate the development gains from improving existing jobs.[18]

3.4 The greening of enterprise, particularly SMEs

The "greening" of enterprises refers to the promotion and implementation of sustainable production and consumption patterns at the enterprise level. This entails the adoption of practices that are energy and resource-efficient, low-waste, low-carbon, and non-polluting so as to reduce an enterprise's environmental footprint.

The role of small and medium-sized enterprises SMEs in the transformation to a green economy will be critical. Enabling SMEs to successfully navigate the shift to a greener economy and to seize the opportunities will be important to ensure that the employment balance is positive and inclusive. In addition to a generally enabling regulatory and institutional environment which makes it easy for businesses to start and grow as part of the formal economy, SMEs are particularly sensitive to access to information and to green markets, to skills programmes, technologies and to finance. Public procurement which can be a major pull factor for green products and services should ensure that SMEs can be suppliers. Similarly, environmental regulation and research and development need to be mindful of the needs and limitations of SMEs. Cooperatives and business associations play a fundamental role to support SMEs to grow and become sustainable.

[18] Although it falls outside of employment and skill policy, it is worth noting that targeted programmes addressing issues ranging from lack of access to clean energy, humane housing, sanitation, food security and basic health care can also make significant contributions to overcoming persistent exclusion. Some 1.4 billion people around the world lack access to electricity, with most living in rural areas with high levels of working poor. One-third of the population in sub-Saharan Africa does not have access to electricity. There is also a strong gender aspect to the issues of access and equity. Women represent the majority of the world's poor and tend to play a greater role than men in natural resource management – farming, planting, heating and cooking.

Annex

A snapshot of employment and sustainable development challenges in sectoral industries[19]

Agriculture

Over 1 billion persons are active in farming, mostly smallholders experiencing high levels of poverty; agriculture is one of the largest emitters of greenhouse gases, user and polluter of water.

Forestry

The destruction of forests is the second largest source of greenhouse gases, and threatens the livelihoods of 45–50 million people (full time equivalents) employed in the forestry sector and of some 410 million indigenous people and communities mostly in developing countries dependent on forests.

Fisheries

Employ 45 million workers full or part time, mostly small-scale operators in developing countries; a quarter of global fisheries is overused and half is currently fully used.

Energy

The energy producing sector accounts for some 4.3 million direct and indirect jobs currently. These include over 1.5 million in biofuels, 670,000 in wind power, above 600,000 in solar PV, 870,000 in solar hot water, 15,000 in solar thermal power, and 600,000 in biomass.

Manufacturing

Responsible for around 35 per cent of global electricity use, over 20 per cent of CO_2 emissions, and over a quarter of primary resource extraction; aluminium, iron and steel, and electric and electronic products employ some 25 million workers.

Recycling

Worldwide, recycling employs 15-25 million people, mostly in informal and hazardous jobs. Major potential for developing new, green, formal jobs.

Buildings

Largest emitter of greenhouse gases and a major employer with over 110 million construction workers.

Transportation

The transport sector (aviation, shipping, and road, rail and mass transport) consumes more than half of global liquid fossil fuels and contributes about a quarter of energy-related carbon dioxide emissions. The sector employs 50 million jobs linked to motor vehicle manufacture and use, over 15 million in rail and mass transit and 12 million in the air transport sector.

[19] Additional information on these sectors can be found in ILO: *Working towards sustainable development: Opportunities for decent work and social inclusion in a green economy* (Geneva, forthcoming).