



---

## **Just transition of the workforce, and the creation of decent work and quality jobs**

### **Technical paper by the secretariat**

#### *Summary*

This technical paper provides an overview of the work undertaken under the Convention on a just transition of the workforce, and the creation of decent work and quality jobs (hereinafter referred to as just transition) in the context of the impact of the implementation of response measures. The paper also presents the general concept of just transition, including the drivers and objectives of such transitions, and then discusses the linkages between just transition and the impacts of the implementation of climate change mitigation policies. It also provides guidance on how to approach just transition at the national level. This technical paper draws upon relevant information contained in: (1) reports on the work of the forum on the impact of the implementation of response measures, as well as submissions, presentations and statements made by Parties and observer organizations during previous sessions of the Conference of the Parties and the subsidiary bodies from 2008 to 2015; (2) national inventory reports, national communications, biennial reports and biennial update reports submitted by Parties; (3) publications by experts, international organizations and research institutes; and (4) inputs from the International Labour Organization.



## Contents

	<i>Paragraphs</i>	<i>Page</i>
I. Background .....	1–10	3
A. Mandate .....	1–3	3
B. Objective, scope and approach of the technical paper .....	4–8	3
C. Structure of the technical paper .....	9	4
D. Possible actions by the subsidiary bodies .....	10	4
II. Overview of the work under the Convention .....	11–23	4
A. Work of the subsidiary bodies .....	11–18	4
B. Synthesis of information contained in the national submissions of Parties ....	19–23	6
III. Just transition of the workforce, and the creation of decent work and quality jobs.	24–96	7
A. Understanding climate change policies .....	24–25	7
B. The global employment situation.....	26–28	11
C. The effect of climate change mitigation on employment.....	29–47	11
D. Guiding principles for just transition .....	48–55	15
E. Drivers and objectives .....	56–81	17
F. Major existing work on just transition outside the scope of the Convention ..	82–96	21
IV. Linkages of just transition and the impacts of the implementation of mitigation policies and actions .....	97–194	25
A. Understanding the impacts of a mitigation policy .....	100–102	27
B. Research and early assessment of the impacts of a mitigation policy on the workforce .....	103–153	27
C. Consultation and social dialogue .....	154–166	39
D. Training and skills development.....	167–183	43
E. Social protection and security.....	184–192	47
F. Post assessment of just transition measures and their sustainability.....	193–194	49
II. The way forward .....	195–209	50
A. Key messages and concluding remarks .....	195–204	50
B. Possible elements of the work programme of the improved forum on the impact of the implementation of response measures .....	205–209	51
References .....		53

## **I. Background**

### **A. Mandate**

1. The Conference of the Parties (COP), at its twenty-first session, decided to continue and improve the forum on the impact of the implementation of response measures (hereinafter referred to as the improved forum), and adopted the work programme, comprising two areas: (1) economic diversification and transformation; and (2) just transition of the workforce, and the creation of decent work and quality jobs.<sup>1</sup>
2. COP 21 requested the Chairs of the subsidiary bodies to convene the improved forum in order to implement the work programme.<sup>2</sup>
3. The Subsidiary Body for Scientific and Technological Advice (SBSTA) and the Subsidiary Body for Implementation (SBI), at their forty-fourth sessions, convened the first meeting of the improved forum and agreed to implement a three-year work programme.<sup>3</sup> As part of this work programme, the subsidiary bodies requested the secretariat to prepare a technical paper on a just transition of the workforce, and the creation of decent work and quality jobs (hereinafter referred to as just transition) for their consideration and discussion at SBSTA 45 and SBI 45.<sup>4</sup>

### **B. Objective, scope and approach of the technical paper**

4. The main objective of this technical paper is to assist Parties in the process of just transition of their national workforces, and the creation of decent work and quality jobs in relation to the implementation of climate change mitigation policies (also referred to as 'response measures').
5. This technical paper provides a step-by-step guide for Parties, in particular developing country Parties, on how to undergo such a transition. Furthermore, this paper provides input to assist Parties in elaborating on the work programme of the improved forum.
6. In order to achieve these objectives, this paper first provides an overview of the work under the Convention in relation to just transition, in the context of the impact of the implementation of climate change mitigation policies. Relevant information contained in the national inventory reports (NIRs), national communications (NCs), biennial reports (BRs) and biennial update reports (BURs) submitted by Parties is also considered in this paper.
7. This paper also draws upon information, knowledge, lessons learned, analysis and research from various sources, including international organizations, research institutes and independent experts.
8. The International Labour Organization (ILO), having approved the guidelines for a just transition towards environmentally sustainable economies and societies for all (ILO, 2015a), has made a substantial contribution to the drafting of this technical paper.

---

<sup>1</sup> Decision 11/CP.21, paragraphs 1 and 5.

<sup>2</sup> Decision 11/CP.21, paragraph 3.

<sup>3</sup> FCCC/SBI/2016/8, paragraph 119.

<sup>4</sup> FCCC/SBI/2016/8, annex II, and FCCC/SBSTA/2016/2, annex I.

### **C. Structure of the paper**

9. This technical paper consists of four chapters. Chapter I provides background information. Chapter II presents an overview of the work undertaken under the Convention on just transition. Chapter III synthesizes conceptual understanding of just transition in relation to the implementation of climate change mitigation measures and climate change related policies, highlighting the guiding principles, drivers and objectives of just transition and also summarizing major existing work outside the scope of the UNFCCC. Chapter IV links just transition to the impact of the implementation of climate change response measures and offers guidance on how to implement just transition. Chapter V summarizes key messages and suggests potential follow-up actions that can be considered during discussions on the elements of the work programme of the improved forum.

### **D. Possible actions by the subsidiary bodies**

10. The subsidiary bodies may wish to consider the information contained in this technical paper for the purposes of:

(a) Advancing their work on just transition under the improved forum, including in its work programme;

(b) Providing guidance to Parties, in particular developing country Parties, in the transition of their national workforces as a result of climate change and the implementation of climate change related policies;

(c) Providing guidance to the secretariat on preparing additional technical materials and/or conducting training sessions with the purpose of assisting developing country Parties in their just transition processes.

## **II. Overview of the work under the Convention**

### **A. Work of the subsidiary bodies**

11. COP 17<sup>5</sup> adopted a work programme on the impact of the implementation of response measures. By the same decision, the COP established a forum on the impact of the implementation of response measures, to be convened by the Chairs of the subsidiary bodies to implement the work programme,<sup>6</sup> and identified eight key areas of work, one of which was just transition.

12. As part of the work programme, SBSTA 36 and SBI 36 requested the secretariat to organize an in-forum workshop on the area of just transition.<sup>7</sup> This workshop was held on 5 June 2013 in Bonn, Germany, and co-chaired by Mr. Richard Muyungi, Chair of the SBSTA, and Mr. Tomasz Chruszczow, Chair of the SBI. It was attended by 72 participants, including those representing Parties, international organizations and research institutions, and experts.

13. In the workshop, Parties expressed their views, one of which is that there are economic and social impacts on workforces as a result of transition and transformation actions such as the provision of agricultural subsidies and the imposition of standards and tariffs. The impacts differ depending on the national circumstances. While green jobs

---

<sup>5</sup> Decision 8/CP.17, paragraph 1.

<sup>6</sup> Decision 8/CP.17, paragraph 3.

<sup>7</sup> FCCC/SBSTA/2012/2, paragraph 45, and FCCC/SBI/2012/15, paragraph 167.

utilize higher-level skills in the workforce and can offer better remuneration, developing countries face challenges because of their relatively weaker institutions and a large and rising youth population looking for work, which necessitates education and training programmes to enable those young people to enter the labour market.<sup>8</sup>

14. Parties also expressed the view that there is a need to successfully manage transition and transformation in order to ensure that workers do not unduly suffer in this process. Investment in education and job training was noted as a valuable supporting action with co-benefits.

15. It was also expressed that national experiences can serve as best practice guidance for managing transition and transformation. A number of measures would be needed to ensure that the transition is well managed at the national level. The following actions were suggested during the workshop:

- (a) Encouraging social dialogue among all stakeholders;
- (b) Developing skills and retraining for green jobs;
- (c) Developing green enterprises;
- (d) Promoting active labour policies;
- (e) Providing social protection;
- (f) Minimizing hardship for workers;
- (g) Introducing appropriate public policies to address the needs of workers;
- (h) Consulting with all stakeholders to develop mechanisms for just transition;
- (i) Ensuring a country-driven process;

(j) Assessing response measures during their design and implementation phases in order to identify possible consequences for employment, economic growth, and so on, in developing countries, in both a quantitative and a qualitative manner.

16. Further to the forum, COP 21 established the improved forum with an aim to focus on two work areas, with just transition being one of them.<sup>9</sup>

17. At SBSTA 44 and SBI 44, a three-year work programme was agreed by Parties. As part of this work programme, on the area of just transition:

- (a) The secretariat was requested to prepare a technical paper on just transition;
- (b) Parties and observer organizations were invited to submit their views and experiences, including case studies, taking into account decision 11/CP.21, paragraphs 1 and 6, in the context of sustainable development, on two areas: economic diversification and transformation, and just transition;
- (c) A workshop on views and experiences, including on case studies, shall be organized on the two areas mentioned in paragraph 17(b) above.

18. The Paris Agreement, in its preamble, clearly states that Parties to it take into account the imperatives of just transition, in accordance with nationally defined development priorities.<sup>10</sup>

<sup>8</sup> FCCC/SB/2013/INF.10.

<sup>9</sup> Decision 11/CP.21.

<sup>10</sup> Annex to decision 1/CP.21, preamble, paragraph 10.

## B. Synthesis of information contained in the national submissions of Parties

19. The national submissions of Parties include:

(a) NCs, NIRs and BRs by Parties included in Annex I to the Convention (Annex I Parties);

(b) NCs and BURs by Parties not included in Annex I to the Convention (non-Annex I Parties).

20. Annex I Parties have been reporting:

(a) In their NCs, information on ways to minimize the adverse effects of the implementation of policies and measures, pursuant to Article 7, paragraph 2, of the Kyoto Protocol. More detailed information is included in the compilation and synthesis reports produced by the secretariat;<sup>11</sup>

(b) In their NIRs, in accordance with Article 3, paragraph 14, of the Kyoto Protocol, how they strive to implement the commitments mentioned in Article 3, paragraph 1, of the Kyoto Protocol, in such a way as to minimize the adverse social, environmental and economic impacts on developing country Parties, particularly those defined in Article 4, paragraphs 8 and 9, of the Convention;

(c) In their second biennial reports, information on the assessment of the economic and social consequences of response measures. In the most recently submitted second biennial reports (as at 1 January 2016), 27 out of 44 Annex I Parties provided this information in accordance with the “UNFCCC biennial reporting guidelines for developed country Parties”.<sup>12</sup>

21. Non-Annex I Parties have been invited to present information in their NCs on their specific needs and concerns arising from the adverse effects of climate change and/or the impact of the implementation of response measures.<sup>13</sup> The “UNFCCC biennial update reporting guidelines for Parties not included in Annex I to the Convention”<sup>14</sup> facilitates reporting by non-Annex I Parties, to the extent possible, on any economic and social consequences of response measures.<sup>15</sup>

22. Some Parties (e.g. Iran (Islamic Republic of) and South Africa) noted that the impacts of the implementation of mitigation measures may have a major impact on their economies, which are highly dependent on income generated from the production, processing, export and consumption of fossil fuels such as coal and petroleum.<sup>16</sup> However, none of the submissions from Annex I Parties and non-Annex I Parties included information related to jobs and just transition of the workforce.

23. Some Parties (e.g. Algeria, Bahrain, Iran (Islamic Republic of), Iraq, Kuwait, Qatar, Saudi Arabia, Singapore, United Arab Emirates,) emphasized their special circumstances of high dependence on fossil fuel production in their intended nationally determined contributions (INDCs). Several Parties mentioned the importance of assessing the impacts of international policies in relation to their response to climate change, and of taking the

---

<sup>11</sup> Available at <[http://unfccc.int/national\\_reports/annex\\_i\\_natcom/compilation\\_and\\_synthesis\\_reports/items/2736.php](http://unfccc.int/national_reports/annex_i_natcom/compilation_and_synthesis_reports/items/2736.php)>.

<sup>12</sup> Decision 2/CP.17, annex I.

<sup>13</sup> Decision 10/CP.2, annex, paragraph 5.

<sup>14</sup> Decision 2/CP.17, annex III.

<sup>15</sup> FCCC/CP/2011/9/Add.1, annex III.

<sup>16</sup> FCCC/SBI/2005/18, paragraph 30.

necessary steps to raise their resilience to these impacts.<sup>17</sup> However, no specific reference to just transition of the workforce was made.

### **III. Just transition of the workforce, and the creation of decent work and quality jobs**

#### **A. Understanding climate change policies**

24. Climate change policies can be divided into two broad categories: mitigation and adaptation. Mitigation policies aim to reduce greenhouse gas (GHG) emissions, and adaptation policies seek to enable adaptation to the effects of climate change. Most measures from both areas will have an impact on the workforce. Careful assessment is needed to fully understand the extent and direction of such impacts. The focus of this paper is the effect of climate change mitigation policies and actions on the workforce.

25. Table 1, from the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), lists the main mitigation options, with a sectoral focus. Governments, when taking these actions, shall consider the impacts these actions have on their national workforce.

---

<sup>17</sup> FCCC/CP/2016/2.

Table 1  
**Climate change mitigation options by sector**

	<i>GHG emissions intensity reduction</i>	<i>Energy intensity reduction by improving technical efficiency</i>	<i>Production and resource efficiency improvement</i>	<i>Structural and systems efficiency improvement</i>	<i>Activity indicator change</i>
Energy [Section 7.5]	<i>Emissions/secondary energy output</i>	<i>Energy input/energy output</i>	<i>Embodied energy/energy output</i>	–	<i>Final energy use</i>
	Greater development of renewable energy (RE), nuclear energy, and (BE)CCS; fuel switching within the group of fossil fuels; reduction of fugitive (methane) emissions	Extraction, transport and conversion of fossil fuels; electricity/heat/fuel transmission, distribution and storage; Combined Heat and Power (CHP) or cogeneration (see Buildings and Human Settlements)	Energy embodied in manufacturing of energy extraction, conversion, transmission and distribution technologies	Addressing integration needs	Demand from end-use sectors for different energy carriers (see Transport, Buildings and Industry)
Transport [8.3]	<i>Emissions/final energy</i>	<i>Final energy/transport service</i>	–	<i>Shares for each mode</i>	<i>Total distance per year</i>
	<b>Fuel carbon intensity (CO<sub>2</sub> eq/megajoule (MJ)):</b> Fuel switching to low-carbon fuels e.g. electricity/hydrogen from low-carbon sources (see Energy); specific biofuels in various modes (see AFOLU)	<b>Energy intensity (MJ/passenger-km, tonne-km):</b> Fuel efficient engines and vehicle designs; more advanced propulsion systems and designs; use of lighter materials in vehicles	Embodied emissions during vehicle manufacture; material efficiency; and recycling of materials (see Industry); infrastructure lifecycle emissions (see Human Settlements)	Modal shifts from light-duty vehicles (LDVs) to public transit, cycling/walking, and from aviation and heavy-duty vehicles (HDVs) to rail; eco-driving; improved freight logistics; transport (infrastructure) planning	Journey avoidance; higher occupancy/loading rates; reduced transport demand; urban planning (see Human Settlements)
Buildings [9.3]	<i>Emission/final energy</i>	<i>Final energy/useful energy</i>	<i>Embodied energy/operating energy</i>	<i>Useful energy/energy service</i>	<i>Energy service demand</i>
	<b>Fuel carbon intensity (CO<sub>2</sub> eq/MJ):</b> Building-integrated RE	<b>Device efficiency:</b> Heating, cooling (high-performance boilers,	Building lifetime; component, equipment, and appliance	<b>Systematic efficiency:</b> Integrated design process; low/zero	Behavioural change (e.g. thermostat setting, appliance use); lifestyle



	technologies; fuel switching to low-carbon fuels, e.g. electricity (see Energy)	ventilation, air-conditioning, heat pumps); water heating; cooking (advanced biomass stoves); lighting; appliances	durability; low(er) energy and emission material choice for construction (see Industry)	energy buildings; building automation and controls; urban planning; district heating/cooling and CHP-smart meters/grids; commissioning	change (e.g. per capita dwelling size, adaptive comfort)
Industry [10.4]	<i>Emission/final energy</i>	<i>Final energy/material production</i>	<i>Material input/product output</i>	<i>Product demand/service demand</i>	<i>Service demand</i>
	<b>Emissions intensity:</b> Process emissions reductions; use of waste (e.g. municipal solid waste (MSW)/sewage sludge in cement kilns) and CCS in industry; HFCs replacement and leak repair; fuel switching among fossil fuels to low-carbon electricity (see Energy) or biomass (see AFOLU)	<b>Energy efficiency/best available technologies:</b> Efficient steam systems; furnace and boiler systems; electric motor (pumps, fans, air compressor, refrigerators, and material handling) and electronic control systems; (waste) heat exchanges; recycling	<b>Material efficiency:</b> Reducing yield losses; manufacturing/construction; process innovations, new design approaches, re-using old material (e.g. structural steel); product design (e.g. light weight car design); fly ash substituting clinker	<b>Product-service efficiency:</b> More intensive use of products (e.g. car sharing, using products such as clothing for longer, new and more durable products)	Reduced demand for e.g. products such as clothing; alternative forms of travel leading to reduced demand for car manufacturing
Human Settlements [12.4]	<i>Emission/final energy</i>	<i>Final energy/useful energy</i>	<i>Material input in infrastructure</i>	<i>Useful energy/energy service</i>	<i>Service demand per capita</i>
	Integration of urban renewables; urban-scale fuel switching programmes	Cogeneration, heat cascading, waste to energy	Managed infrastructure supply; reduced primary material input for infrastructure	Compact urban form; increased accessibility; mixed land use	Increasing accessibility; shorter travel time, and more transport mode options

	<i>Supply-side improvements</i>	<i>Demand-side measures</i>
Agriculture, Forestry and other Land Use (AFOLU) [11.3]	<i>Emissions/area of unit product (conserved, restored)</i>	<i>Animal/crop product consumption per capita</i>
	<p><b>Emissions reduction:</b> of methane (e.g. livestock management) and nitrous oxide (fertilizer and manure management) and prevention of emissions to the atmosphere by conserving existing carbon pools in soils or vegetation (reducing deforestation and forest degradation, fire prevention/control, agroforestry); reduced emission intensity (GHG/unit product)</p>	<p><b>Sequestration:</b> Increasing the size of existing carbon pools, thereby extracting the CO<sub>2</sub> from the atmosphere (e.g. afforestation, reforestation, integrated systems, carbon sequestration in soils)</p>
	<p><b>Substitution:</b> of biological products for fossil fuels or energy-intensive products, thereby reducing CO<sub>2</sub> emissions, e.g. biomass co-firing/CHP (see Energy), biofuels (see Transport), biomass-based stoves, and insulation products (see Buildings)</p>	<p><b>Demand-side measures:</b> Reducing losses and wastes of food; changes in human diets towards less emission-intensive products; use of long-lived wood products</p>

Source: *Climate Change 2014: Mitigation of Climate Change*. Working Group III contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Available at <<http://www.ipcc.ch/report/ar5/wg3/>>.

## **B. The global employment situation**

26. At the same time as climate concerns have risen to unprecedented prominence, urgent social and economic challenges remain unresolved. Securing adequate and decent employment for all jobseekers remains one of the biggest such challenges, and this requires, first and foremost, the creation of an enabling environment for sustainable enterprises to prosper and create jobs. The global financial crisis (beginning in the late 2000s) expanded the ranks of the unemployed and of those in vulnerable employment situations. The number of unemployed people rose from 170 million in 2007 to 197 million in 2015, and may surpass 200 million by 2017 (ILO, 2016). Poor job quality and working poverty pose additional challenges. Some 900 million workers and their dependents live below the USD 2 per day poverty line – most of them in informal employment in developing countries.

27. The United Nations 2030 Agenda for Sustainable Development<sup>18</sup> highlights the importance of inclusive and sustainable economic growth, employment and decent work for all. Achieving Sustainable Development Goal 8 implies that over 600 million new jobs need to be created by 2030 just to keep pace with the growth of the global working age population. That is about 40 million jobs per year according to ILO. Uncontrolled climate change will not only compromise the ability of countries to achieve this goal, it could also reverse gains in economic prosperity, social progress and poverty reduction. Sectors particularly vulnerable to climate change impacts such as agriculture are among the biggest employers. Risks of damage tend to be greater for workers and communities already in situations of vulnerability, including workers in the informal economy, indigenous and tribal peoples, women and youth.

28. Social protection can help vulnerable groups absorb economic pressures and environmental shocks (such as harvest failures, soaring food prices, increased exposure to disease or loss of assets caused by floods and storms). However, about 5.1 billion people, 75 per cent of the world's population, are not covered by adequate social security (ILO, 2011a, b).

## **C. The effect of climate change mitigation on employment**

29. Addressing the climate change challenge requires a fundamental restructuring of the energy supply sector, moving away from the world's fossil fuel-based system to one that relies on clean, renewable sources. An equally important task is to bring about sharp increases in energy efficiency. Reducing GHG emissions implies shifts within and between economic sectors, as well as shifts among different regions of the world. A global transition towards a low-carbon and sustainable economy has both positive and negative impacts on employment. Generally, output and employment in low-carbon industries and services will grow, while energy and resource-intensive sectors are likely to stagnate or contract.

30. There are two aspects to consider regarding the impacts that climate change policies have on employment: quantitative impacts, which in simple terms means number of jobs affected; and qualitative impacts, which looks into the quality of jobs created or transformed.

---

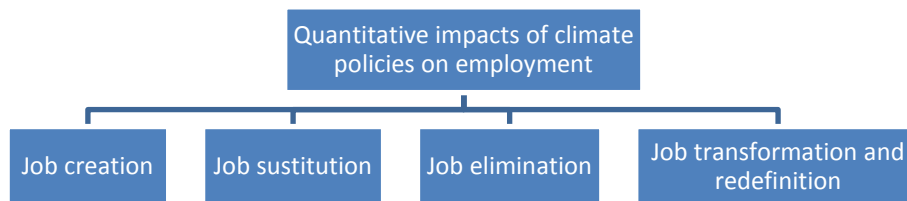
<sup>18</sup> Available at <<https://sustainabledevelopment.un.org/post2015/transformingourworld>>.

1. Quantitative impacts

31. From a conceptual perspective, employment will be affected in four ways (see figure 1) as climate policies reorient the economy towards greater sustainability (UNEP et al., 2008; Strietska-Illina et al., 2011).

Figure 1

Quantitative impacts of climate policies on employment



32. **Job creation.** The expansion of low carbon intensive products, services and infrastructure will translate to higher labour demand across many sectors of the economy. Examples include jobs in: renewable energy; energy efficiency (e.g. manufacturing, transportation, building construction and operations); organic agriculture; adaptation projects intended to protect and restore ecosystems and biodiversity; and infrastructure projects (e.g. flood barriers) intended to adapt to climate change impacts and build resilience. In addition to direct jobs, there are jobs in the supply chain (indirect jobs). As the incomes generated are spent across the economy, they create further employment (induced jobs);

33. **Job substitution.** Some existing jobs will be substituted as a result of shifts in the economy from less to more efficient, from high carbon to low carbon, and from more to less polluting technologies, processes and products. Examples include shifts from fossil fuels to renewables, from truck-based transportation to rail, from internal combustion engine manufacturing to electric vehicle production, and from landfilling to recycling and refurbishing. These shifts can be gradual or sudden, and will likely take place both within and across industries. They have implications for occupational profiles and skills needs;

34. **Job elimination.** Certain jobs may be eliminated – either phased out or massively reduced in numbers – without direct replacement. This may happen where polluting and energy- and materials-intensive economic activities are reduced or phased out entirely. The continued large-scale mining and burning of coal, in particular, is incompatible with a stable climate (chapter IV.B below examines this issue in some detail). Greater energy, materials and water efficiency (along with boosts in recycling of materials and reuse of products) could lead to substantial job losses in primary sectors. As is the case with job creation, there are indirect and induced job elimination effects because of the expansion of low carbon intensive products, services and infrastructure;

35. **Job transformation and redefinition.** Many, and perhaps most, existing workers (such as plumbers, electricians, metal workers and construction workers) will simply have their jobs transformed and redefined as day-to-day workplace practices, skill sets, work methods and job profiles are greened. For instance, plumbers and electricians working in

the brown economy<sup>19</sup> can, in principle, be reoriented to carry out similar work in the green economy. Automobile workers will produce more fuel-efficient (or electric) cars, farmers will apply more climate-appropriate growing methods, and so on.

36. As Strietska-Ilina et al. (2011) put it: “The scale and extent of these changes depend on the speed and breadth of technological and market changes in the green transformation.” Policymakers must smooth the edges of this transformation by developing just transition policies for affected workers and their communities.

37. The employment impacts of a shift towards a climate-compatible economy are, most directly, a result of changes in government policy. Policy changes translate to changes in investments, trade and productivity. Another factor is so-called ‘budget effects’. For example, a (temporary) negative budget effect may result from the introduction of renewable energy (which initially was more expensive than conventional sources of energy, although costs are now falling rapidly). If climate-friendly products and services are more expensive than those they replace, enterprises and households will have fewer resources left to spend on other goods and services, and in turn there will be effects on employment in the sectors providing them. Positive budget effects can occur because of investments in energy and resource efficiency. The resulting savings shift demand away from energy consumption, which has a low employment elasticity, to goods and services with higher elasticities (Poschen, 2015).

38. Most studies that have investigated the net impact on employment of environmental policy measures suggest it is positive. A review of 30 studies (covering individual countries and economic regions) has found that meaningful employment gains either have been achieved or are possible through the pursuit of climate policies (ILO and ILS, 2012). Most of the studies indicated net employment gains of 0.5–2 per cent, or 15–60 million additional jobs globally.

39. Among the studies, the Organisation for Economic Co-operation and Development (OECD) has simulated an emission reduction scenario (ENV-Linkages model) to assess impacts on growth, employment and incomes in its member countries. An environmental tax reform which recycles revenue to reduce the cost of labour would increase employment by 0.8 per cent above business as usual (BAU) levels by 2030, while maintaining real incomes (Chateau, Saint-Martin and Manfredi, 2011). A 2010 study by the World Bank for Brazil found that a low-carbon development path (promoting energy efficiency and renewable energy, and limiting land-use change through a reduction of pasture areas and protection of forests) could expand employment by 1.13 per cent per year above a BAU scenario between 2010 and 2030 (World Bank, 2010).

40. Studies in Australia, Germany and the United States of America suggest that more ambitious climate policies make substantially larger employment gains possible. Employment gains of 5–6 per cent (770,000 jobs) by 2030 compared with a BAU scenario were found in Australia (ACF and ACTU, 2009) and 5 per cent (two million jobs) in Germany (Jaeger et al., 2009). Another study found that an investment of USD 200 billion annually in renewable energy and energy efficiency could generate 4.2 million jobs in the United States (or a net gain of 2.7 million after taking into account job losses in the fossil fuel sector) (Pollin et al., 2014).

41. The emergence of additional jobs requires new competencies and shifts in demand for occupations. There is a need to focus on skills and education policies to facilitate job transition and to improve employability. This is critical because without skilled workers

---

<sup>19</sup> Brown economy (or black economy): economic growth depends only on petrochemicals such as coal, petroleum and natural gas.

and competent enterprises, the shift to a low-carbon economy will be neither technically feasible nor economically viable (ILO and ILS, 2012).

42. The likelihood that the overall net employment outcome will be positive should not obscure the reality that far-reaching mitigation policies will change global, regional and national economies in potentially profound ways and severely disrupt the lives of affected workers and their communities. Regions which lack diversification (with a high degree of dependence on a single industry), which have a limited capacity for innovation, or whose economic mainstay is vulnerable to decisions made elsewhere will face the greatest challenge, as will workers with skills that are in less demand or who are unable to acquire new skills. The situation is also more challenging if the shift in demand of occupation is in a sector that offers a big share of employment for the region (e.g. agriculture). Such concerns are particularly strong for (but not limited to) developing countries.

43. The number of workers affected by mitigation policies is potentially very large, as the following two examples from China indicate. In the late 1990s, a logging ban instituted in the wake of devastating floods led to the loss of close to one million state forestry jobs (Poschen, 2015). More recently, the Chinese government announced a plan to close thousands of coal mines (to reduce overcapacity and address climate change), a policy that will lead to the loss of an estimated 1.3 million jobs in the coal sector, along with 500,000 jobs in the steel industry – equivalent to about 20 per cent and 11 per cent of China’s total workforce in these two sectors (Yan, 2016).

44. Two challenges that must be addressed in this context concern geographical and temporal disconnects. The low-carbon economy may not create (sufficient numbers of) jobs in the locations where jobs are lost in the conventional economy. Likewise, green jobs creation may not happen at the same time, or at the same pace, as conventional job losses occur. To the extent possible, these disconnects need to be bridged by transition policies in order to minimize dislocation and human suffering.

45. The extent and speed of change towards a low-carbon economy present two critical factors with regard to the magnitude of the adjustment challenge. To date, mitigation policies (such as replacing fossil fuels with renewable energy) have had limited impact; most of the employment changes have been due to industrial restructuring and growing mechanization, unconnected to sustainability policies. The impact of mitigation policies will rise, as countries implement the INDCs they have formulated. Arguably, however, far more ambitious policies will be needed in order to comply with the stated goal of the Paris Agreement of “... holding the increase in the global average temperature to well below 2 °C above pre-industrial levels”. Indeed, a growth-oriented economy may not be compatible with a climate-safe economy. Greater climate ambition translates to greater economic restructuring, more fundamental transformations of production and consumption patterns, and therefore more pronounced and widespread employment impacts. The longer that adequate action is delayed, the more change will need to happen on a compressed timescale, and thus the more severe the impacts on the world of work.

## **2. Qualitative impacts**

46. Another dimension which is important – along with the increased number of jobs created, lost or transformed – is the quality of employment. Jobs created in the transition to a low-carbon economy must be ‘decent’. This means jobs that provide adequate incomes and social protection, safe working conditions, respect for rights at work and effective social dialogues. Decent work and the four pillars of the Decent Work Agenda of ILO (employment creation, social protection, rights at work and social dialogue) also became

integral elements of the 2030 Agenda for Sustainable Development adopted by the United Nations General Assembly in September 2015.<sup>20</sup>

47. Occupational hazards reduce with low-carbon economy transition (Poschen, 2015; UNEP et al., 2008). For example, a shift to renewable energy will avoid many of the severe health dangers associated with coal mining. But at the same time there are some new hazards that need attention; for example, workers producing solar photovoltaic (PV) panels are exposed to number of toxic substances and electrical hazards; thin-film and emerging nanotechnology-based solar technologies may prompt additional concerns (SVTC, 2009, 2014; EASHW, 2011).

#### **D. Guiding principles for just transition**

48. The UNFCCC is based on a number of key principles contained in Article 3 of the Convention. Such principles form the basis of the climate regime and define roles and responsibilities of the different categories of countries. Among those principles are:

(a) The historical responsibility of developed country Parties and the principle of “common but differentiated responsibilities and respective capabilities”;<sup>21</sup>

(b) That measures to combat climate change should not be used as an arbitrary or unjustifiable discrimination or restriction on international trade;<sup>22</sup>

(c) That responses to climate change should be integrated with social and economic development, and recognize the specific needs of developing country Parties that are particularly vulnerable to the adverse effects of climate change.<sup>23</sup>

49. With increased implementation of mitigation policies, along with uneven regulations around the world, there is a need to understand what is arbitrary or legitimate.

50. Key to the social dimensions that should be considered in the formulation and implementation of response measures to climate change is the need to attain the transition of the workforce alongside sustainable development. Sustainable development means that the needs of the present generation should be met without compromising the ability of future generations to meet their own needs. Sustainable development has three dimensions – economic, social and environmental – which are interrelated and of equal importance, and must be addressed together.

51. While the global goal of achieving sustainable development in its three dimensions is common to all countries, there are different approaches, models and tools available to each country, in accordance with its national circumstances and priorities. A just transition for all towards an environmentally sustainable economy needs to be well managed and contribute to the goals of decent work for all, social inclusion and the eradication of poverty.

52. Decent work, poverty eradication and environmental sustainability are three of the defining challenges of the twenty-first century. Economies must be productive to meet the needs of the world’s growing population. Societies must be inclusive, providing opportunities for decent work for all, reducing inequalities and effectively eliminating poverty. This entails that no one is left behind, as articulated in the 2030 Agenda for Sustainable Development, including indigenous and tribal peoples, people with disabilities, women, youth and other persons, peoples, groups and communities in vulnerable situations.

<sup>20</sup> United Nations General Assembly resolution A/RES/70/1.

<sup>21</sup> UNFCCC, Article 3, paragraph 1.

<sup>22</sup> UNFCCC, Article 3, paragraph 5.

<sup>23</sup> UNFCCC, Article 3, paragraph 2.

53. From the perspective of decent work and just transition, the guidelines for a just transition towards environmentally sustainable economies and societies for all (ILO, 2015a) include the following principles:

(a) Strong social consensus on the goal of and pathways to sustainability is fundamental. Social dialogue has to be an integral part of the institutional framework for policymaking and implementation at all levels. Adequate, informed and ongoing consultation should take place with all stakeholders;<sup>24</sup>

(b) Policies should respect, promote and realize fundamental principles and rights at work;

(c) Policies and programmes need to take into account the strong gender dimension of many environmental challenges and opportunities. Specific gender policies should be considered in order to promote equitable outcomes;

(d) Coherent policies across the economic, environmental, social, education and training and labour portfolios need to provide an enabling environment for enterprises, workers, investors and consumers to embrace and drive the transition towards environmentally sustainable and inclusive economies and societies. These policies also need to provide a just transition framework for all in order to promote the creation of more decent jobs, including, as appropriate: anticipating impacts on employment; adequate and sustainable social protection for job losses and displacement; skills development; and social dialogue, including the effective exercise of the right to organize and bargain collectively;

(e) There is no 'one size fits all'. Policies and programmes need to be designed in line with the specific conditions of countries, including their stage of development, economic sectors, and types and sizes of enterprises.

54. In implementing sustainable development strategies, it is important to foster international cooperation among countries. In this context, the outcome document of the United Nations Conference on Sustainable Development (Rio+20),<sup>25</sup> including section VI on means of implementation, is relevant.

55. ILO constituents, including governments and workers' and employers' organizations, discussed and adopted key guiding principles for a just transition towards environmentally sustainable economies and societies at the International Labour Conference in 2013. The conclusions and resolution on sustainable development, decent work and green jobs, adopted by the Conference, provided a policy guiding framework.<sup>26</sup> Guidelines for a just transition towards environmentally sustainable economies and societies for all were drafted by the Tripartite Meeting of Experts on Sustainable Development, Decent Work and Green Jobs convened from 5 to 9 October 2015 in Geneva, Switzerland. These guidelines for a just transition towards environmentally sustainable economies and societies for all (ILO, 2015a) were approved by the ILO Governing Body through a decision adopted in November 2015,<sup>27</sup> and are hereinafter referred to as the ILO guidelines.

---

<sup>24</sup> An example of positive social dialogue is the Spanish tripartite round tables established in 2005 to implement the country's commitments to GHG emission reductions under the Kyoto Protocol (ILO, 2010a). The round tables were instrumental in forging agreements on policies to address impacts on competitiveness, employment and social cohesion in the most-affected sectors.

<sup>25</sup> United Nations General Assembly document A/RES/66/288.

<sup>26</sup> International Labour Conference, 102<sup>nd</sup> Session, 2013, Resolution concerning sustainable development, decent work and green jobs.

<sup>27</sup> ILO Governing Body document GB.325/POL/3. Available at <[http://www.ilo.org/gb/GBSessions/GB325/pol/WCMS\\_420286/lang--en/index.htm](http://www.ilo.org/gb/GBSessions/GB325/pol/WCMS_420286/lang--en/index.htm)>.



## **E. Drivers and objectives**

### **1. Opportunities and challenges**

56. The transition to environmentally sustainable economies and societies presents major opportunities and challenges for countries. The transition to low-carbon, environmentally and socially sustainable economies can become a strong driver of job creation, job upgrading, social justice and poverty eradication, if properly managed with the full engagement of governments, workers and employers' organizations (ILO 2013; Gueye et al., 2015; Gueye 2016). At the same time, policy responses to climate change imply important structural transformations that will affect national economies, enterprises, workers and communities.

57. Overall, there is growing consensus that a transition to greener economies can yield positive economic, social and environmental outcomes, acting as a strong driver of job creation, social justice and poverty eradication. The triple benefits of a structural transformation towards a low-carbon economy are: (1) climate-resilient economic growth and prosperity; (2) a reduction of GHG emissions; and (3) more productive, gainful and decent jobs.

58. Some major opportunities include:

(a) Net gains in total employment from realizing the potential to create significant numbers of additional decent jobs through investments in environmentally sustainable production and consumption and the management of natural resources;

(b) Improvements in job quality and incomes on a large scale from more productive processes, as well as low carbon intensive products and services in sectors such as agriculture, construction, recycling and tourism;

(c) Social inclusion through improved access to affordable, environmentally sustainable clean energy with health benefits which are of particular relevance to women and residents in rural areas.

59. The transition towards inclusive and low-carbon economies must be just and fair, maximizing opportunities for economic prosperity, social justice, rights and social protection for all, leaving no one behind. For this reason, the Paris Agreement stated the imperative of just transition as essential elements of climate action.

60. Although winners are likely to far outnumber losers, the negative impacts should not be overlooked or taken lightly. Some workers will be hurt in the restructuring towards sustainability. Workers, but also enterprises, contractors (which are mainly small to medium sized enterprises) and communities heavily dependent on mining, fossil fuels and energy-intensive industries are faced with a substantial challenge to diversify their economies, and there will be impacts throughout the supply chain of these industries. Public policy, therefore, should seek to minimize disparities among putative winners and losers that arise in the transition to a low-carbon economy, and to minimize job losses and other socially and economically disruptive impacts (UNEP et al., 2008).

61. Some major challenges include:

(a) Economic restructuring, resulting in the displacement of workers and possible job losses and job creation attributable to the greening of enterprises and workplaces;

(b) The need for enterprises, workplaces and communities to adapt to climate change to avoid loss of assets and livelihoods and involuntary migration;

(c) Adverse budget effects on poor households owing to higher energy and commodity prices.

62. Given the scale and urgency of these environmental and employment challenges, it is clear that the world will have neither the resources nor the time to tackle them separately or consecutively. Tackling them jointly is therefore not an option, but a necessity. Economic prosperity and employment depend in fundamental ways on a stable climate. Building a low-carbon global economy involves large-scale investments in new technologies, equipment, buildings and infrastructure, which will provide a major stimulus for much-needed new employment and an opportunity for protecting and transforming existing jobs.

## **2. Key policy areas and institutional arrangements for a just transition for all**

63. The greening of economies in the context of sustainable development and poverty eradication will require a country-specific mix of macroeconomic, industrial, sectoral and labour policies that create an enabling environment for sustainable enterprises to prosper and create decent work opportunities by mobilizing and directing public and private investment towards environmentally sustainable activities. The aim should be to generate decent jobs all along the supply chain, in dynamic, high value added sectors that stimulate the upgrading of jobs and skills, as well as job creation and improved productivity in more labour-intensive industries that offer employment opportunities on a wide scale.

64. The challenge cuts across several domains, so there is a need for mainstreaming sustainable development across all areas and for cooperation and coordination between employment authorities and their counterparts in various fields, including finance, planning, environment, energy, transport, health, and economic and social development. Institutional arrangements must be adapted to ensure the participation of all stakeholders at the international, national, regional, sectoral and local levels in the building of an appropriate policy framework. Internal coherence should be sought among institutions at the national level as well as within international institutions at the regional and global levels for the effective integration of the three dimensions of sustainable development.

65. Key policy areas to address environmental, economic and social sustainability simultaneously, as derived from the ILO resolution on sustainable development, decent work and green jobs adopted by representatives of governments and workers' and employers' organizations at the International Labour Conference in 2013 (see para. 51 above) include:

### **(a) Macroeconomic and growth policies**

66. Macroeconomic and growth policies should promote sustainable production and consumption patterns, and place full and productive employment and decent work for all at the centre of economic and social policies. Targeted fiscal policy measures, market-based instruments, public procurement, and investment policies can create frameworks for enterprises and investors to adopt or promote more innovative economic practices, based on the sustainable use of resources, leading to better access to economic opportunities and more inclusive labour markets. These policies can have adverse income distribution effects, in particular in relation to energy poverty, which should be taken into account in their design.

67. Appropriate laws, regulations and other policies aimed at environmental improvements that lead to resource and energy efficiencies and the prevention of environmental and social degradation can align private incentives with public policy objectives and can be cost-effective in the long term. Legislative and regulatory certainty and the rule of law are needed in order to promote environmental and social sustainability, while stimulating innovation and investments in human, social and environmental capital.

These are the prerequisites for long-term competitiveness and economic prosperity, social cohesion, quality employment and better environmental protection.

**(b) Industrial and sectoral policies**

68. The greening of economies is a global challenge, but many environmental problems are sectoral, and the search for solutions and the adoption of policies starts at the sectoral level. Numerous countries have used industrial policy to support the shift to the greening of their economies. Industrial and sector-related policies, and when appropriate, public–private partnerships and public–public partnerships, are effective in complementing macroeconomic policies, in helping to improve both the environmental and the employment performance of existing businesses, and in stimulating growth in green products and services. Efforts need to focus on key sectors that are most relevant for environmental sustainability and job creation in the national economy, such as agriculture, water management and sanitation, forestry, fisheries, energy, resource-intensive industries, recycling, waste management, buildings and transport. Targeted measures will be needed to formalize substandard, informal jobs in environment-related sectors, such as recycling and waste management, in order to transform them into decent jobs.

69. Sectors often have specific governance instruments and institutions. Because of these shared features, employers and workers engage in collective bargaining and other forms of social dialogue at the sectoral level, all of which present opportunities to pursue economic, environmental and social objectives in an effective way.

**(c) Enterprise policies**

70. Governments should foster the greening of jobs through regulatory and non-regulatory frameworks that support environmental and social sustainability while stimulating innovation and encouraging investments both at home and abroad. Special attention is needed to ensure that such frameworks provide an enabling environment and assist micro, small and medium-sized enterprises (MSMEs), including cooperatives and entrepreneurs, in making the transition.

71. Most jobs are created by MSMEs, yet little information on making operations more resource efficient and environmentally responsible is specifically targeted to MSMEs. Providing such information in a format that is easily accessible at this level would greatly strengthen employers' capacity to enhance environmental and labour performance. Regulatory systems should have enforcement capacity and be structured to provide advice to business on how compliance can be achieved.

**(d) Skills development**

72. There should be strong interaction between the world of work and the world of education and training. The greening of the economy should focus on skills development in order to succeed. Solid technical and vocational education and training systems need to involve industry and trade unions. Access to training helps workers to develop the skills needed to transition to new types of jobs or to work with new materials, processes and technologies in their existing jobs. Measures to develop skills that support entrepreneurship, resilience, innovation in enterprises (including MSMEs), and their transition to sustainable practices are critical factors for success.

73. Education and training for green jobs presupposes an approach based on comprehensive lifelong learning. National skills development and employment policies linked to broader development plans need to incorporate education for environmental awareness with coherent skills strategies to prepare workers, in particular young people, for the future sustainable world of work. Education and training systems should be designed to meet the needs of youth, women, vulnerable workers and workers in rural areas, enabling them to contribute to and benefit from economic diversification and rural economic

empowerment. Equally, training programmes need to target displaced workers and those who lost jobs because of greening to ensure their swift re-entry into the labour market.

**(e) Occupational safety and health**

74. Many economic activities for environmental sustainability present health and safety risks related to minerals, chemicals and pesticides, among other things. Ensuring that all jobs, including green jobs, are decent, safe and healthy is a key aspect of improving job quality. Switching from fossil fuels to renewables, for instance, entails changes in the occupational safety and health situation. Occupational safety and health standards and training must be an essential component of all skills training. Practical prevention measures should be adopted at the enterprise level, based on risk assessment and the principles of elimination and control of hazards. Policies and programmes under national systems for occupational safety and health should be continuously improved in the light of the new challenges to ensure that green jobs are safe. Adequate capacity of the labour inspectorate is essential to ensure compliance.

**(f) Social protection**

75. Sound, comprehensive and sustainable social protection schemes are an integral part of a strategy for transition towards a sustainable development pattern, built on principles of decent work, social justice and social inclusion. They should provide workers displaced by technological change or those affected by natural disasters with income support as well as access to health care and basic services during the transition, and thereby reduce inequality.

76. Targeted assistance to groups, regions and occupations affected by the transition is essential. For example, public and private employment programmes can have large multiplier effects by combining employment generation, income support and conservation of natural assets. It is integral that social protection policies be coordinated with vocational training and active labour market policies to ensure the social dimension of a sustainable economy.

**(g) Active labour market policies**

77. In many ways the transition to a green economy will pose challenges similar to those of earlier transitions caused by technological revolutions, globalization and rapid changes in world markets. Active labour market policies can help enterprises and workers, including unemployed workers, meet these challenges. The anticipation of changing labour market demands, through sound labour market information and data collection systems, as well as social dialogue, is essential to helping governments, employers, workers, and education and training systems identify the skills needed currently and in the future, and to take appropriate measures to provide timely training. Employment services are important for brokering workforce transition to greener occupations and improving the match between labour demand and supply.

**(h) Rights**

78. International labour standards offer a robust framework for addressing the challenges to the world of work associated with the greening of the economy and, more broadly, with the transition towards sustainable development and poverty eradication. Several international labour standards are important in this regard, including those covering: freedom of association and the right to collective bargaining; prohibition of forced labour, child labour and non-discrimination; social dialogue; tripartite consultation; minimum wage; labour administration and inspection; employment policy; human resource development; occupational safety and health; and social security.

**(i) Social dialogue and tripartism**

79. Mechanisms of social dialogue, including tripartism and collective bargaining, serve as effective tools for the design of policies at all levels. Social dialogue can contribute to just transition by building on the commitment of workers and employers to joint action.

80. The ILO guidelines include detailed recommendations for governments and social partners for all these policy areas.

**3. Drivers of change**

81. Broad, and interrelated, drivers of change include: physical transformations brought on by a changing climate and by the mitigation and adaptation requirements they necessitate; innovation and technology development; markets for more climate-friendly products and services, as well as changing consumer habits; and, critically, government policies and regulations (Strietska-Illina et al., 2011). Across the key policy areas identified in section 2 (paras. 59–76 above), a range of policy instruments can provide both mandates and incentives for the adoption of green workplace practices and for investment in new green products and services, and thus help to bring about a climate-compatible economy. They include (Poschen, 2015):

(a) Instruments that provide or reinforce signals to the market, such as taxes, fees, tradable permits, price guarantees, subsidies and preferential loans. Such instruments can stimulate technological innovation and other changes in corporate practices. Conversely, detrimental subsidies that support polluting or destructive practices or impede greater efficiency in enterprises and households can be modified or reduced. However, care is needed to avoid or minimize socially regressive impacts, and to compensate for unavoidable effects;

(b) Regulatory instruments such as norms, standards, emissions abatement policies, quotas and mandates that direct economic activities in more environment- and climate-friendly directions;

(c) Public investment in favour of developing infrastructure with low environmental impact or the rehabilitation of natural resources and ecosystems;

(d) Public procurement policies in favour of product designs that are more environmentally sound;

(e) Information-based instruments such as eco-labelling, awareness raising and public disclosure.

**F. Major existing work on just transition outside the scope of the Convention**

82. The concept of just transition has been addressed by a number of organizations other than the UNFCCC.

83. ILO has actively participated in the long chain of environment and sustainable development activities within the United Nations system, from the United Nations Conference on the Human Environment in Stockholm in 1972, to the United Nations Climate Change Conference in Paris in 2015, at which the Paris Agreement was adopted. In 1980, ILO, in cooperation with the United Nations Environment Programme (UNEP), convened a Meeting of Workers' Organizations on the Environment in Nairobi. The report to the meeting noted the growing concern about: "the steady rise of carbon dioxide in the atmosphere, which may rise (sic) the average temperature if it continues unchecked, with a possible major change of the world's climate". Even though the concept of just transition

was not yet mentioned as such, the need for transition measures was highlighted. It was said that an essential element of an environmental policy must include arrangements for adversely affected workers, by financial compensation, by a contribution to the cost of moving to another home, by retraining with pay in order to qualify for another job, by early retirement without loss of benefits, or by other adjustment measures. Together with the importance of consultation, these elements were also included in the meeting's recommendations (Räthzel and Uzzell, 2013).

84. The recommendations were followed, in 2013, by conclusions and a resolution concerning sustainable development, decent work and green jobs by the International Labour Conference (see para. 51 above), and in 2015 by the ILO guidelines. These guidelines provide a practical orientation for governments and social partners on how to formulate, implement and monitor a policy framework for just transition.

85. ILO constituents (governments and workers' and employers' organizations) have assessed the concept from different points of view, according to their political and sectoral interests, their geographical scope of work and their expectations about the direction of the transition they are aiming at.

86. The first statements addressing the idea of reconciling environmental protection with job creation and good working conditions can be found in the trade union movement as early as 1998 (Rosemberg, 2010). It was acknowledged that a different development paradigm was required, where both protecting the environment and better working conditions for all were urgently needed. Proponents of just transition supported the idea that these two were not opposing objectives but rather were intrinsically linked – reaching one was not possible without accomplishing the other. They believed, however, that a number of policies were needed to ensure that workers in polluting sectors were adequately protected and new jobs in greener sectors could be created.

87. In 2010, at the second International Trade Union Confederation (ITUC) Congress, a resolution on combating climate change through sustainable development and just transition was adopted (ITUC, 2010). ITUC recognized that “the multiple crises the world is facing – energy, food, jobs and climate – have common origins in a socially unjust, environmentally unsustainable and economically inefficient model incapable of providing decent work and decent lives to millions of people”. In that resolution, trade unions called for a “fair, ambitious and binding international climate change agreement and just transition policy framework aimed at reducing greenhouse gases and dependence on fossil fuels” and committed to a programme of action to further support the work of the ITUC affiliates working on this agenda at the national and international levels. National trade union confederations from different countries (Belgium, Brazil, Canada, Spain, and many others) and sectoral federations (industry, public services and others) have issued similar resolutions.

88. Employers' organizations and business associations recognize that the impacts of environmental and climate change on business are clearly being felt. The position of business in the sustainable development debate has evolved since the United Nations Conference on Environment and Development in 1992 (the first Rio Conference, also known as the Earth Summit). For business, a major outcome from the United Nations Conference on Sustainable Development in 2012 (Rio+20) was the recognition that business needs to be part of the policy development process because enterprises are the main source of actions and solutions in this complex transition. The contribution of business to Rio+20 was a Business Day organized by the Business Action for Sustainable Development (known as BASD 2012), a temporary coalition of the foremost business leaders and organizations committed to sustainable development serving as the official United Nations representation of business and industry for Rio+20. The BASD 2012 Business Day hosted more than 800 leaders of government, business, the United Nations

system, non-governmental organizations (NGOs) and other organizations. The key messages of the event included:

- (a) Business recognizes the need for urgent action to address sustainability challenges, and urges governments to engage with the private sector to address this need;
- (b) Businesses, and other organizations, are actively moving forward, with or without formal action at the international level, to promote both corporate sustainability and sustainable development in general;
- (c) While celebration of the progress made since 1992 is merited, particularly in terms of the investments made by business in global sustainability, these efforts have not had the desired impact at the global level;
- (d) Business commits to scaling up collective efforts to address the growing lack of sustainability in our global consumption patterns;
- (e) Business is the primary investor in, and the primary solution provider for, sustainable development;
- (f) The vast majority of the technology and skills necessary to achieve sustainable development at scale already exist;
- (g) Collectively, there is an implementation gap; collaboration between business and government, particularly at the local level, provides the best hope for an accelerated transition to a low-carbon economy, and to a sustainable future.

89. The changes will affect enterprises of all sizes and sectors, and will also provide new business and employment opportunities. The International Organisation of Employers (IOE), the global voice of business for labour and social policy matters at the international level, monitors and influences the employment and social policy dimensions of sustainable development, environment, climate change and green jobs to inform members of developments, analyses the implications for enterprises, and provides effective employer advocacy.

90. IOE has identified four main priorities for employers at the global level:

- (a) Building resilience for enterprises and communities;
- (b) Establishing efficient use and sustainable management of key resources;
- (c) Developing well-functioning markets and effective regulatory conditions;
- (d) Improving governance and stimulating private sector involvement.

91. IOE recognizes that:

- (a) Pursuing cost-effective, long-term, environmentally sustainable production makes business sense;
- (b) Enterprise engagement will be essential for workplaces and societies to evolve into more efficient and sustainable lower-carbon entities;
- (c) Business is a part of the solution to addressing the impacts of climate change;
- (d) The private sector is a natural partner in international efforts to reduce GHG emissions, to use resources more efficiently, to invest in research and development (R&D) into climate-friendly technologies, and to share good practices on adaptation and resilience;
- (e) Business can play a constructive role in informing the entire life cycle of climate policy, helping to set priorities, policy options and action;

(f) International business brings a unique global insight and technical expertise that will be vital in tackling climate change while maintaining robust economic growth.

92. Priority is given to assessing the impact of environmental and climate change on: jobs and the competitiveness of climate change policies, carbon markets, emissions trading and other market-based approaches; sectoral approaches and jobs within sectors; and adaptation challenges such as jobs created or lost, retraining and capacity-building.

93. Business and workers’ associations have joined their voices to propose a number of measures to facilitate just transition at the national, regional<sup>28</sup> and international levels.<sup>29</sup>

94. Table 2 gathers the most prominent reports, joint declarations and symposiums from some of the relevant organizations.

Table 2

**Key reports, declarations and symposiums relating to just transition**

<i>Name of the organization</i>	<i>Title of the report (year of publication)</i>	<i>Link with just transition</i>
Greenpeace International	<i>The Solution to the Climate Crisis: a Just Transition to 100% Renewable Energy for All by 2050 (2010)<sup>a</sup></i>	More jobs can be created in a 100 per cent renewable energy world. These jobs are already exceeding the number of jobs in fossil fuel industries. These jobs are key to ensuring a climate-safe world where access to energy is available to all
Friends of the Earth	<i>Is a Just Transition to a Low-carbon Economy Possible Within Safe Global Carbon Limits? (2011)<sup>b</sup></i>	The report identifies the changes that are necessary for the United Kingdom to stay within its share of a global carbon budget and considers the social justice implications of relevant policies
World Wide Fund for Nature (WWF)	<i>A Just Transition for Our Common Home: Renewable Energy, Labour and Poverty Eradication. Symposium concept note<sup>c</sup></i>	A just transition must include justice in the context of climate change, justice in sustainable energy provision and development, justice in climate finance and justice in labour opportunities
Oxfam International	<i>Extreme Carbon Inequality (2015)<sup>d</sup></i>	The report assesses the links between global emissions of greenhouse gases and inequality, and proposes the need for a just transition for workers to be placed within the implementation of climate policies at the core of a global climate agreement

<sup>a</sup> Available at <<http://www.greenpeace.org/international/Global/international/briefings/climate/COP20/A-just-transition-to-100-renewable-energy.pdf>>.

<sup>b</sup> Available at <[https://www.foe.co.uk/sites/default/files/downloads/just\\_transition.pdf](https://www.foe.co.uk/sites/default/files/downloads/just_transition.pdf)>.

<sup>c</sup> Available at <[http://www.focsiv.it/wp-content/uploads/2016/05/WWF\\_JET\\_2016.pdf](http://www.focsiv.it/wp-content/uploads/2016/05/WWF_JET_2016.pdf)>.

<sup>d</sup> Available at <[https://www.oxfam.org/sites/www.oxfam.org/files/file\\_attachments/mb-extreme-carbon-inequality-021215-en.pdf](https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/mb-extreme-carbon-inequality-021215-en.pdf)>.

<sup>28</sup> See the European Trade Union Congress’ “Statement from the Coalition for Higher Ambition”. Available at <<https://www.etuc.org/documents/statement-coalition-higher-ambition#.V8Pg1Ft96Uk>>.

<sup>29</sup> See <<http://www.ituc-csi.org/historic-partnership-of-business>> for further information about the joint declaration on the just transition dialogue for a zero-carbon future signed by ITUC, We Mean Business, The B Team, the International Alliance of Catholic Development Agencies, Friends of the Earth, Action Aid, Greenpeace, Christian Aid, World Wide Fund for Nature and Oxfam International.



95. A number of governments have framed their climate change policies around the need to ensure a socially fair transition to all affected by climate change and its policies. The European Union (EU) was one of the first to do so. The European Commission has adopted decisions linked to the need to ensure a transition towards a low-carbon world in a socially just manner. In a recent communication, the European Commission described the Paris Agreement as a significant landmark in the global fight against climate change and one that ensures a healthy world and a fairer society to future generations. The European Commission furthermore admits that strong political determination is required to secure the transition to a climate resilient and climate neutral future, in a socially just manner (European Commission, 2016). The EU has placed greater emphasis on two particular areas of just transition: impacts on labour markets of low-carbon development, and opportunities for the creation of green jobs and of green investments; and the need for new skills or redefinition of existing skills to realize the potential of these green jobs. Relevant policies have been adopted by the EU over the years.

96. South Africa has also incorporated the need to ensure a just transition for all in its vision “for an effective climate change response to a climate-resilient and lower-carbon economy and society” as stated in its National Climate Change Response white paper (Department of Environmental Affairs of South Africa, 2012). The paper acknowledged that climate change impacts and policies may worsen the already high unemployment levels and that severe income distortions owing to climate change may limit people’s ability to build resilience to the impacts of climate change. Vulnerable low-income households and marginalized unemployed people will face the most severe impacts. At the same time, new jobs in low-carbon sectors may be created. In order to address these impacts, climate change policies incorporate an employment and social impacts dimension. A National Employment Vulnerability Assessment and a Sector Jobs Resilience Plan were among the planned interventions. The provision of skills, public funds to support employment creation in low carbon emitting activities and climate-resilient activities, and public employment programmes and other social protection measures to support vulnerable workers owing to climate change impacts or policies have been among the measures taken by the Government of South Africa.

#### **IV. Linkages of just transition and the impacts of the implementation of mitigation policies and actions**

97. This chapter offers guidance on just transition in a sequential manner: from the consideration of the employment factor during the planning of a climate change response measure; to the preparation of the transition of the workforce; to the implementation of the transition; and finally to the assessment of the effect of such a transition. It illustrates, on a national level, what elements a government needs to consider for a just transition of its workforce to maximize the positive impacts and minimize the negative impacts.

98. As an overview, this section discusses the following:

- (a) Understanding the impacts of a climate change mitigation policy;
- (b) Research and early assessment of the impacts of a mitigation policy on the workforce;
- (c) Consultation and social dialogue;
- (d) Training and skills development;
- (e) Social protection and security;
- (f) Post assessment of the just transition measures and their sustainability.

99. The main elements of a just transition framework are presented in figure 2.

Figure 2  
**Elements of a just transition framework**



## **A. Understanding the impacts of a mitigation policy**

100. In order to address the impacts of climate change mitigation policies, it is important that the climate change policies incorporate an employment and social impacts dimension.

101. The examples from the EU and South Africa (see paras. 91–92 above) demonstrate that, as a first step, it is important to understand the employment aspects of a climate change policy, and to make sure that the component of ‘affected workers’ is included in the planning and throughout implementation of the policy.

102. This first step of understanding the employment impacts of a mitigation policy may include the following actions:

- (a) Integrate provisions for just transition into the policy design;
- (b) Involve the ministry in charge of labour issues in the agenda of the policy design. During this involvement simply assigning the task of workforce transition to that ministry should be avoided;
- (c) Promote close collaboration during both the design phase and throughout the implementation phase between relevant national ministries, including ministries of economic planning and finance, with a view to finding the best solutions for the workers affected;
- (d) Actively promote and engage in social dialogue and promote the creation, development and formalization of dialogue mechanisms and structures at all levels to discuss the best means to implement national social, economic and environmental goals;
- (e) Establish and strengthen institutional and technical capacity of subnational authorities at the regional and local levels to guide the transition of the workforce and to address the necessary changes in regional economies;
- (f) Establish or strengthen the availability of and access to basic labour market data.

## **B. Research and early assessment of the impacts of a mitigation policy on the workforce**

### **1. Understanding the national circumstances in relation to climate change management**

103. Various methods and modelling tools can be used to conduct such assessments. Note, however, that using any assessment method or model developed to benefit developing countries requires a thorough understanding of local socioeconomic conditions and national priorities in the area of climate change management. Important points for consideration include the following:

- (a) The structure of the economy. Factors relevant to policies aimed at reducing GHG emissions in a developing country include:
  - (i) The importance of the sector(s) involved in the country’s economy;
  - (ii) The scale of activities involved in the emission reduction action;
  - (iii) The framing of emission reduction efforts in terms of ‘low-carbon development pathways’ rather than the carbon mitigation strategies referred to in industrialized economies. (The challenge in developing countries with low per capita emissions is to find a low-GHG development trajectory, whereas in the OECD countries the primary challenge is to achieve economic development while substantially cutting existing emission levels);

(b) The climate change mitigation priorities. Article 4, paragraphs 8 and 9, of the Convention list the developing country groups that are most vulnerable to climate change and/or the impact of the implementation of response measures. For these countries, climate change mitigation has a very high priority;

(c) The impact of regulations and policies. For example, national labour standards and legal frameworks;

(d) The quality of information systems and the availability of data required to undertake the assessment. Developed countries typically have stronger information and monitoring systems on which to base an analysis, and registered employment in the formal economy is dominant. However, the amount of data available in developing countries is either poor across the country or sufficient yet not available because the management of data takes place only on the regional level.

## 2. Analysis of impacts by sector

104. When considering the impacts that mitigation policies have on the workforce, a number of sectors stand out in terms of their importance for climate sustainability. Together, these sectors employ about half of the global workforce (see table 3). Agriculture provides livelihoods for many people who are among the most vulnerable to climate change. The energy sector, which weighs-in at far less in terms of employment, is nonetheless central to the way in which virtually every other part of the economy functions. A successful energy transition is therefore critical to the move towards a climate-compatible economy. Following an assessment of the agriculture sector, this section will therefore look in some detail at the energy transition challenge (specifically, the move away from coal and the expansion of renewable energy). More briefly, the section will offer some findings with regard to the building sector, which also plays an important role for both GHG emissions and employment, and where energy efficiency is a critical aspect of rendering employment more sustainable.

Table 3

### Global direct employment in sectors critical to climate stability

<i>Sector</i>	<i>Employment (millions of people)</i>
Agriculture	1 000
Forestry	44
Energy <sup>a</sup>	30
Manufacturing (resource-intensive)	200
Buildings	110
Transport	88
<b>Total</b>	<b>1 472</b>

*Source:* Adapted from Poschen P. 2015. *Sustainable Development, Decent Work and Green Jobs*. Sheffield, United Kingdom, Greenleaf Publishing.

<sup>a</sup> *Energy [R]evolution: a Sustainable World Energy Outlook 2015* puts global energy employment at 28.4 million jobs in 2015 (Greenpeace International, Global Wind Energy Council and SolarPowerEurope. 2016. Available at <<http://www.greenpeace.org/international/en/campaigns/climate-change/energyrevolution/>>).

105. The most polluting economic activities tend to contribute relatively little to employment. Among OECD countries, just seven industries account for over 80 per cent of total carbon dioxide (CO<sub>2</sub>) emissions from fossil fuel burning, but they employ only about

10 per cent of the workforce (albeit in mostly well-paid jobs) (ILO and OECD, 2012). This picture tends to hold true for countries beyond those in the OECD as well.

106. Changes owing to climate and environmental policies are only one among several factors leading to job losses. In fact, to date, greening has been a minor factor (ILO and ILS, 2012). The principal causes of declining employment in industries such as mining, fossil energy, and iron and steel have been the increasing automation and rising labour productivity that have been occurring over several decades. As countries around the world try to render their economies more climate-compatible, however, impacts from climate and environmental policies will rise in the coming years and decades.

107. The remainder of chapter IV.B below provides more detailed information and data on impacts by sector, including examples of modelling exercises, case studies and results of relevant studies.<sup>30</sup>

**(a) Agriculture and ecosystem protection**

108. Although its share has fallen over the last two decades, agriculture remains the sector with by far the largest workforce in the world – about one in every three workers. But it is also the sector that has the highest concentration of poor people, with agricultural incomes growing more slowly than gross domestic product (GDP) (ILO, 2013). Agriculture is a significant contributor to environmental degradation (land degradation, water pollution, loss of biodiversity) and one of the largest emitters of GHGs; and demand for food production is likely to continue rising (although a reduction in food waste would help to ameliorate this pressure). At the same time, agriculture is perhaps the sector most vulnerable to climate change (Poschen, 2015).

109. UNEP (2011) suggests that these challenges can be met by a strong commitment to disseminate farming methods with a low environmental impact. Evidence from various countries strongly suggests that low-impact (organic) methods tend to be more labour-intensive than conventional farming, therefore opening an opportunity for new workers to be absorbed into agricultural jobs, at least in the short to medium term. Training farmers in organic agriculture methods will require an appropriate investment in extension services.

110. A study of 1,144 organic farms in the United Kingdom of Great Britain and Northern Ireland and in the Republic of Ireland concluded that organic farms employ 135 per cent more full-time equivalent jobs per farm than conventional farms (Morison et al., 2005). A study published by The Soil Association came to a more cautious conclusion, but still found that organic farming provides, on average, 32 per cent more jobs per farm in the United Kingdom than conventional agriculture (ILO and ILS, 2012).

111. Assessments of cotton and sugar cane production in India come to similar conclusions. Cotton cultivation employs some seven million people, but conventional methods consume large amounts of pesticides and cause soil depletion. Sharma and Pandove (2010) found that organic methods utilized more labour in fertilization, irrigation and plant protection than traditional methods in Punjab state while maintaining yields, and concluded that a conversion to organic farming could create 2.68 million additional jobs. Meanwhile, Tirado (2010) found that organic farmers in South India earned 200 per cent more net income than farmers who grew genetically engineered cotton. For India's sugar cane crop, organic labour requirements are about 17 per cent higher because of the need for preparatory tillage, manuring and managing pests and diseases. The estimated additional jobs potential amounts to 0.42 million jobs.

112. Organic methods have also been shown to be more labour-intensive in intercropping field trials in Kenya and in an integrated pest management project in Cameroon (ILO and

<sup>30</sup> Some of the case studies are presented in boxes 1–4.

IILS, 2012). Following a decade of expansion, by 2013 Uganda had the largest organic farmland area in Africa, and the world's thirteenth largest organic farming sector. Since then, the area of organic cultivation has continued to grow, reaching about 227,000 hectares, and the number of farms certified as organic has risen to almost 188,000. Incomes improved as farm-gate prices of organic produce rose to substantially higher levels than those of conventional products, and exports expanded. GHG emissions per hectare from organic farming are estimated to be on average 64 per cent lower than emissions from conventional farms, because organic fields sequester 3–8 tonnes more carbon per hectare than conventionally cultivated fields (Tumushabe et al., 2007; Namuwoza and Tushemerirwe, 2011; UNCTAD and UNEP, 2008).

113. As part of a global assessment, Herren et al. (2011) ran a macroeconomic model simulating green investments in the agriculture sector and concluded that the transition to sustainable agriculture could create over 200 million full-time jobs across the entire food production system by 2050. However, this overall positive finding should not obscure the fact that mitigation policies will have adverse impacts. There is therefore a need to design and implement policies to smooth the transition towards a sustainable agricultural system. Additional work needs to be undertaken to improve the understanding of likely impacts and to develop adequate transition measures.

114. Solutions should be adapted to specific situations, built on the local farming system and developed in cooperation with the farming communities themselves. The organization of farmers and workers is an important stepping stone to giving rural communities a voice in policymaking for rural development and greening agriculture, and the inclusion of women farmers is especially important. Organization will also be critical for acquiring the capability to implement more productive, low environmental impact farming methods. The formation of cooperatives can help with access to know-how, inputs, finance and markets at fair prices, as illustrated by the experience of large cooperatives such as the Oromia Coffee Growers in Ethiopia,<sup>31</sup> which is bringing substantial benefits to over 200,000 producers of organically grown coffee, or the cocoa farmer cooperative Kuapa Kokoo in Ghana.<sup>32</sup> In Costa Rica and India, cooperatives have become leaders in the production of carbon-neutral coffee and in using agricultural residues for power generation.

115. In industrialized countries, skills upgrading coupled with reforms of agricultural subsidies towards remuneration of environmental services would make a major contribution to the transition of workers and also improve incomes and export prospects in developing countries (ILO, 2013).

**(b) Fossil fuel sector transition: coal**

116. The bulk of the world's energy system still relies on fossil fuels, which accounted for 78 per cent of global final energy consumption in 2014. But renewable energy is beginning to make inroads. Traditional biomass has an 8.9 per cent share, while modern renewables account for 10.3 per cent and nuclear power accounts for the remaining 2.5 per cent (REN21, 2016). Still, global fossil fuel production remains at a historic peak, with only coal output dipping 5 per cent since 2013 (BP, 2016). To date, adverse employment changes in the fossil fuels sector have been the result of industry restructuring and consolidation, and rising mechanization. Climate policies will need to bring about a fundamental change in the global energy mix in coming years and decades. The result will be further job losses in the fossil fuel sector – in coal mining, in exploration and production of oil and gas, and at fossil fuel-powered power plants. Coal, as the dirtiest and most carbon-intensive fuel, will bear the brunt of the changes that will come as a result of the implementation of the Paris Agreement.

---

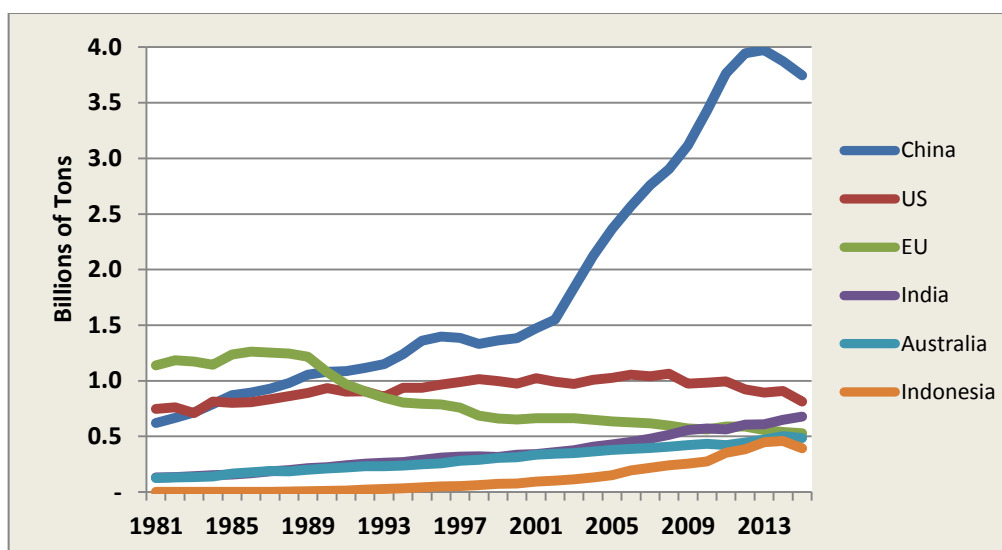
<sup>31</sup> See <<http://www.oromiacoffeeunion.org/>>.

<sup>32</sup> See <<http://www.kuapakokoo.com/>>.

117. The trajectories of leading coal-producing countries have diverged considerably (see figure 3). EU member States have seen their combined coal production fall since the mid-1980s, with even stronger job loss. Output in the United States of America started to decline in 2008, but rising automation has driven employment down even while output was expanding. China's production rose steeply in the decade to 2013, but has since fallen by 6 per cent. On the other hand, India, Australia and Indonesia, the next-largest producers, have seen a strong rise in their output.

Figure 3

**Coal production in leading coal-producing countries, 1981–2015**



Source: BP. 2016. *Statistical Review of World Energy 2016*. Available at <<http://www.bp.com/statistical-review>>.

118. Global coal mining employment data are sparse. A decade ago, the World Coal Institute put employment in the sector at about seven million jobs. Output has risen by close to 30 per cent since then, but growing automation has likely tempered a concomitant rise in employment. Still, the latest *Energy [R]evolution* report (Greenpeace International, Global Wind Energy Council and SolarPowerEurope, 2016) estimates employment at 9.7 million in 2015. China, which produces nearly half the world's coal, is alone estimated to employ some 6.5 million coal miners today.<sup>33</sup> As is the case in India and Indonesia, labour productivity in China is much lower than that of the United States or Australia, so that its share of global output is not indicative of its share of employment. It is unclear how many people work in coal-fired power plants globally. The utility sector as a whole was estimated by ILO (2011c) to employ some 11 million people worldwide, but this figure includes not just all power plants but also water utilities, and is certainly dated.

119. The experiences of countries undergoing job retrenchment in the coal sector highlight both obstacles and encouraging policy lessons. The story of Germany (see paras. 116–126 below) underlines the need for well-planned, well-designed and socially fair transition strategies, including social protection, retraining efforts and economic diversification of regions most dependent on the coal industry.

120. German hard coal output fell from 150 million tonnes in 1957 to 80 million tonnes in the mid-1980s, and then plummeted to just 7.6 million tonnes in 2014 (Statistik der Kohlenwirtschaft, 2015). In 2007, the Government of Germany decided to end hard coal

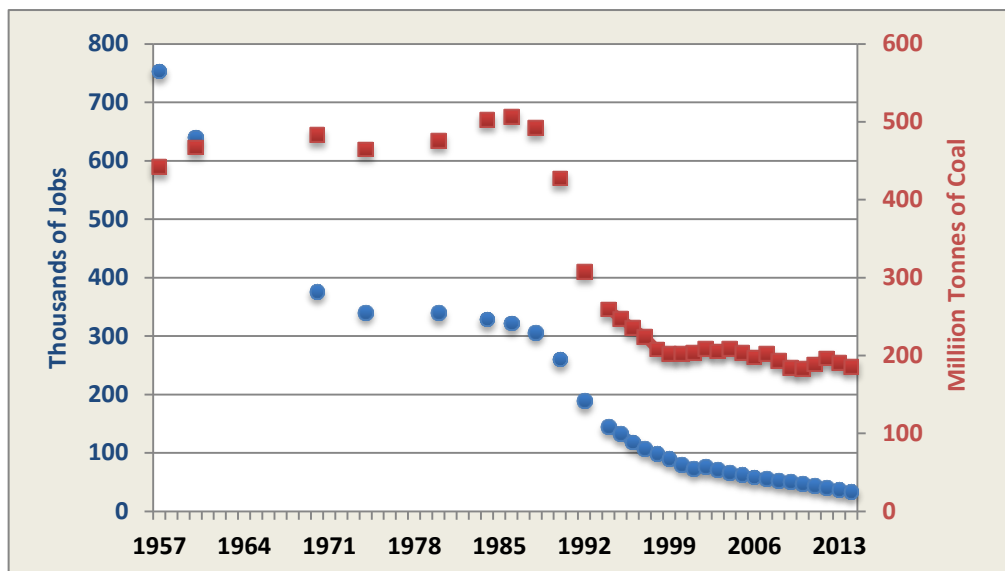
<sup>33</sup> This is a calculation based on figures reported by Yan (2016).

mining entirely by 2018 (Der Spiegel, 2007). Brown coal (lignite) had been a major energy source for East Germany, with output reaching a peak of 425 million tonnes in the mid-1980s. Following reunification, however, production dropped rapidly to 177 million tonnes in 1997, a level at which it has remained.

121. Total employment in Germany’s coal mining industry has dropped from about 753,000 in the late 1950s to about 33,500 in 2014, an astounding 96 per cent decline (see figure 4). From the 1950s to the 1980s, automation eliminated jobs even while production held roughly even. But the plunge in production from the 1990s onwards accelerated job loss.

Figure 4

**Coal production and employment in Germany, 1957–2014**



Source: Statistik der Kohlenwirtschaft. 2015. *Der Kohlenbergbau in der Energiewirtschaft der Bundesrepublik Deutschland im Jahre 2014*. Herne and Köln.

122. Galgóczi (2014) examines the transformation of the Ruhr region, Germany’s prime hard coal-producing area, for general lessons in managing the transition challenges inherent in such a steep drop in coal employment. Even though resource depletion, automation and rising competition from imports were the main driving factors, the lessons of dealing with this crisis are useful to consider in the context of climate-driven transitions.

123. For many years, the region was locked into its dependence on the coal and steel industries, preventing innovation and economic diversification. The power of a few large corporations played a role, as did the high concentration of supplier firms reliant on them. It was only in the 1980s and 1990s that the Ruhr region began serious efforts to overcome this dependence, a process shaped by the federal and state governments, with significant worker participation.

124. **Social protection and skills training.** The average age of the German coal industry worker is 46 years and rising (Statistik der Kohlenwirtschaft, 2015). Galgóczi observes that, for thousands of coal workers, an early retirement plan was developed by the state government of North Rhine-Westphalia (NRW) in 1972, with transition payments for up to five years to bridge the time until workers became eligible for pension payments. Efforts were made to find younger workers other jobs, with the help of personnel development centres and agencies specializing in employment promotion and training. The Ruhr Kohle



Bildungsgesellschaft (Ruhr Coal Vocational Training Society) was charged with assessing current and expected demand for skills and with organizing training programmes.

125. **Technology development.** In the mid-1980s, the NRW state government began to set up a total of 29 local technology transfer centres offering support to new business start-ups in promising areas, particularly environmental technology (whose beginnings were rooted in the pollution control and abatement efforts of the region's coal sector and steel industries). By the mid-2000s, firms, universities and research institutes in the growing environmental technology sector employed some 100,000 people altogether.

126. **Incubation.** With the help of billions of euros in federal government money, a range of high-tech businesses were attracted to Emscher Park International Building Exhibition, a public-private initiative in operation from 1989 to 1999. Intended to help reinvigorate the region's economy, society and ecosystems, the initiative spawned more than 120 projects with a combined investment of EUR 2.5 billion and created about 5,000 jobs. One example is the Science Park Gelsenkirchen, established in 1996. It led to the rise of a sustainable industry cluster with hundreds of renewable energy jobs (producing solar modules, solar thermal collectors, heat pumps, cogeneration units and wind turbine parts), and prompted additional employment in education, science and R&D (Jung, 2008; Solarstadt Gelsenkirchen, undated). A more recent effort (2011) is InnovationCity Ruhr in Bottrop, a public-private partnership which seeks to lead the transformation of the city into a climate-friendly one with projects on energy-efficient retrofits of buildings, development of renewable energy, sustainable mobility and integrated urban management (ICLEI, 2014).

127. **Renewable energy.** Companies formerly supplying coal mining equipment have reoriented themselves towards renewable energy technologies. Galgóczi (2014) observes that "Some of the world's leading producers of wind turbine parts, Voith Turbo, BHS Getriebe and IBC Wälzlager GmbH, were originally producers of coal mining machinery." Siemens is another prominent example, as is Teramex, which has moved to drilling equipment for geothermal energy.

128. **Restoration.** Zollverein, once the world's largest coal mining site, became a flagship initiative within the region's action programme. Former miners found employment in restoration activities (building renovation, solar panel installation and the establishment of green spaces). In Dinslaken, another former coal mining site, is to be transformed into a tree plantation to supply biomass for heating.

129. **Social dialogue.** Mining employment in the Ruhr area has been radically downsized. Nevertheless, it was not until 1993 that the bargaining parties first signed an agreement guaranteeing a socially responsible approach to the manpower restructuring programme. The workforce agreed to forgo a wage increase and, in order to avoid compulsory redundancies, a work redistribution programme was introduced in the form of additional non-working days – referred to as 'free shifts'. Meeting the challenges posed by a personnel restructuring process of such magnitude requires a targeted and coordinated set of statutory, collective bargaining and contractual regulations and initiatives. Early retirement has been and will be an important instrument for the socially responsible downsizing process. However, even if the early retirement potential is exploited to its full capacity, the degree of downsizing required between now and the final closure of the industry cannot be achieved without the use of additional instruments. As in the past, the bargaining parties have therefore faced up to their sociopolitical responsibilities and created a new unified concept that is geared towards achieving these objectives. The agreement on the closure of the German coal industry by 31 December 2018 that was negotiated between the German Coal Association (GVSt) and the trade union for mining, chemical and energy industries (IG BCE) came into force on 1 April 2012. The agreement provides a framework for the balance of interests, building on a social compensation plan and various work agreements (ILO, 2014a).

130. A key lesson that emerges from Germany’s coal transition (Galgóczi, 2014) is that a successful transition takes time, a strong vision of the future and adequate resources. Worker co-determination (as part of a cooperative tripartite structure) has been an important factor in the coal sector, facilitating solutions that embraced social protection and retraining efforts. Even so, attempts at economic diversification face uncertainty and sometimes fail. For instance, the city of Bochum attracted a Nokia cell phone assembly plant in 1998, but it closed a decade later, resulting in the loss of 4,300 direct and indirect jobs. But in establishing higher education institutions and technology centres, the region did manage to lay the foundations of a knowledge-based economy as an alternative to the coal- and steel-centred economy.

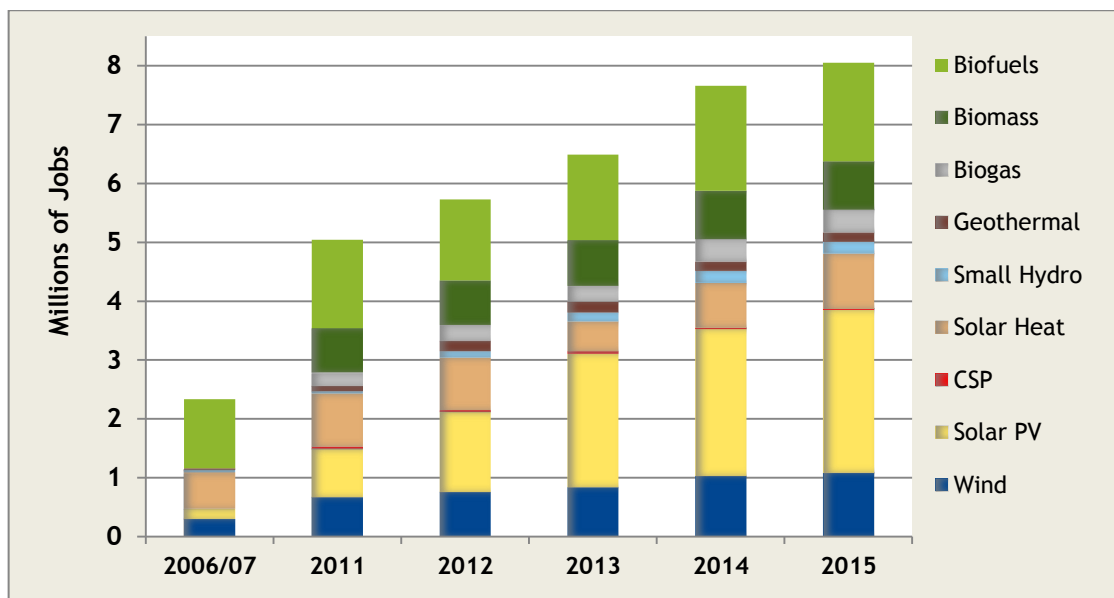
**(c) Employment trends and decent jobs in renewable energy**

131. Along with energy efficiency, clean energy is one of the key ways in which the energy system can be transformed in line with climate goals. Rising investment and falling costs have been the drivers behind an expansion of renewables, with wind power and solar PV the most dynamic sectors. Global employment has grown substantially in recent years, reaching an estimated 8.1 million jobs in 2015<sup>34</sup> (see figure 5). Employment relating to solar PV has exploded in recent years, because PV panels are becoming cheaper and more affordable.

132. Most renewable energy employment is found in Brazil, China, EU member States, India and the United States. These employers are the key equipment manufacturers and account for the bulk of generating capacity installed to date. However, many other countries are now developing and expanding their domestic markets, with rising employment primarily in sales and distribution, installations, and operations and maintenance.

Figure 5

**Estimates of global employment in renewable energy, 2006/07–2015**



Note: These estimates exclude large hydropower.

<sup>34</sup> The estimates reflect annual data collection efforts based on a wide range of sources, including government agencies, industry and NGO studies, academic reports, and interviews with experts. Inevitably, the underlying methodologies vary, however, and data gaps remain.

Sources: (1) UNEP, ILO, IOE and ITUC. 2008. *Green Jobs: Towards Decent Work in a Sustainable, Low-carbon World*. Available at <[http://www.unep.org/PDF/UNEPGreenjobs\\_report08.pdf](http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf)>; (2) ILO and ILS. 2012. *Working Towards Sustainable Development: Opportunities for Decent Work and Social Inclusion in a Green Economy*. Available at <[http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms\\_181836.pdf](http://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/@publ/documents/publication/wcms_181836.pdf)>; (3) IRENA. 2014. *Renewable Power Generation Costs in 2014*. Available at <[https://www.irena.org/DocumentDownloads/Publications/IRENA\\_RE\\_Power\\_Costs\\_2014\\_report.pdf](https://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Power_Costs_2014_report.pdf)>; (4) IRENA. (2015). *Renewable Energy Capacity Statistics 2015*. Available at [http://www.irena.org/DocumentDownloads/Publications/IRENA\\_RE\\_Capacity\\_Statistics\\_2015.pdf](http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Capacity_Statistics_2015.pdf)>; (5) IRENA. 2016. *Renewable Energy and Jobs. Annual Review 2016*. Available at <[http://www.se4all.org/sites/default/files/IRENA\\_RE\\_Jobs\\_Annual\\_Review\\_2016.pdf](http://www.se4all.org/sites/default/files/IRENA_RE_Jobs_Annual_Review_2016.pdf)>.

133. The renewable energy industry has seen strong growth in recent years, and this expansion is likely to continue. But it is important to note that this growth has, to date, supplemented jobs in the fossil fuel sector, rather than replaced them. This may well change if GHG emissions are cut as strongly as called for by climate science; in other words, if there is a comprehensive transition from fossil fuels to renewables (and to energy efficiency).

#### **(d) Buildings and construction**

134. Buildings are among the biggest users of energy, water and materials, and they are the single largest emitter of GHGs. Aligning building construction and management with climate goals is urgent, given that the global building floor area could grow by 24 per cent between 2013 and 2023 (Navigant Research, 2015). Renewable heat and electricity will help to make buildings more sustainable, but the sector also has enormous potential for improving the efficiency with which it uses energy. This has implications for employment as well. Experience in both industrialized and developing countries suggests that the construction of energy-efficient buildings requires competent enterprises and a skilled workforce (Poschen, 2015). But a move towards greener buildings needs to be paired with efforts to improve job quality in the sector.

135. Whereas cities in emerging and developing economies are expanding their building stock rapidly (and can avoid being locked into high resource consumption by choosing efficient designs), cities in the older industrialized countries with a mature building stock can reduce the energy footprint with retrofits that improve insulation and air tightness or by replacing inefficient lighting and equipment. A range of policy tools can be used to achieve these objectives, including: performance monitoring; zoning regulations and other mandates; building codes, permits and performance ordinances; taxes and subsidies; and social housing and public works programmes (Renner, 2016a).

136. The renovation of existing structures and the construction of new energy-efficient buildings represent large potential employment benefits. Jobs are created not only directly in the construction sector, but also indirectly in supplier industries that produce insulation materials and energy efficiency equipment and materials, as well as in energy services (Syndex, S. Partner and WMP, 2009; Trabish, 2011).

137. Examples from the EU, Germany, Hungary and the United States underscore the employment generation potential. A large-scale renovation programme for energy efficiency in Germany was initiated jointly by trade unions, employers and NGOs, a cooperative model rooted in social dialogue. It mobilized investments of at least EUR 118 billion, and as of 2010 had helped to create or maintain some 340,000 jobs in the building industry (Government of Germany, undated). In Hungary, a ‘deep retrofit’ programme could generate up to 131,000 net jobs (after taking into account job losses in the energy sector); a less ambitious ‘shallow retrofit’ undertaking would see the creation of only 43,000 new jobs (Ürge-Vorsatz, 2010). In the EU, an assessment of the potential impacts of the 2010 energy performance of buildings directive for the period 2011–2050 concluded that an accelerated pace of renovation could generate 0.5–1.1 million jobs annually (Buildings Performance Institute Europe, 2011). A study in the United States found that

energy efficiency retrofits of pre-1980 building stock could reduce electricity use by 30 per cent and create more than 3.3 million cumulative job-years of employment (Deutsche Bank Climate Change Advisors and Rockefeller Foundation, 2012).

138. A number of social housing programmes have embraced sustainability goals (Renner, 2016a). Brazil offers the most prominent example in its Minha Casa, Minha Vida (My House, My Life) programme (MCMV), which seeks to reduce the country’s massive housing deficit for low-income families. Since MCMV’s launch in March 2009, it has enabled the construction of nearly four million housing units for low-income families. The housing units must meet specific environmental requirements, including having rainwater collection systems and using certified timber. Solar water heaters were made compulsory for houses in the southern half of Brazil, and close to 900,000 residents in MCMV housing now have them. The manufacturing and installation of the solar water heaters was expected to create 30,000 skilled jobs (ECLAC, 2010). Since June 2015, the government-owned Caixa bank has offered preferential loan terms for energy-efficient housing built under the programme. Developers need to be certified under certification programmes such as LEED<sup>35</sup> or BREEAM<sup>36</sup> or one of three Brazilian green building standards (Renner, 2016a).

Box 1

**Decent work through sustainable housing construction in Zambia**

In Zambia, an innovative joint programme by five United Nations agencies (Food and Agriculture Organization of the United Nations, International Labour Organization (ILO), International Trade Centre, United Nations Conference on Trade and Development and United Nations Environment Programme) – known as the Zambia Green Jobs Programme – aims to create jobs through affordable and sustainable urban housing for the poor.

The joint programme, which runs from 2012–2017, takes a private sector development approach to increasing the capacity of small construction enterprises to access: training in modern green building techniques; business skills; and finance and markets.

Trained enterprises offer green housing which:

- Is cheaper than conventional housing, because of the use of local stabilized soil blocks (SSB) rather than conventional cement;
- Provides access to electricity through photovoltaic panels;
- Provides clean water through, for example, water harvesting technology;
- Reduces carbon emissions and running costs over the lifetime of the building.

As green housing requires more local materials, more jobs are created compared with conventional housing. To achieve transformational change of the construction sector, ILO works with the national government, social partners (including Zambia Congress of Trade Unions and Zambia Federation of Employers) and multinational investors. The Government of Zambia is currently revising the building guidelines to integrate modern green construction technology so as to create an enabling environment for construction businesses. ILO also engaged in a partnership with LafargeHolcim, a global leader in the building industry, to promote affordable and sustainable housing in Zambia. Through this partnership, five demonstration houses were built to identify which are the most cost-effective and environmentally friendly building designs that also create the most jobs.

The best performing green demonstration house will now serve as a model for

<sup>35</sup> Leadership in Energy and Environmental Design. See <<http://www.leed.net/>>.

<sup>36</sup> Building Research Establishment Environmental Assessment Method. See <<http://www.breeam.com/>>.

LafargeHolcim's investment to construct 800 housing units. The ILO–LafargeHolcim partnership was instrumental to the incorporation of a new spin-off company, called 14Trees, that will set up SSB production plants in neighbouring Malawi. To prove the climate change mitigation effect of the green housing programme in Zambia, a partnership with MyClimate is underway to certify carbon reductions. The Zambia Green Jobs Programme shows how an employment-led green growth strategy has a triple win: for jobs, the environment and the poor in need of urban climate-smart housing.

Source: Zambia Green Jobs Programme website. See <<http://www.zambiagreenjobs.org/>>.

139. Worldwide, building construction employs at least 110 million workers in formal jobs, plus an unknown number of informal labourers facing generally poor working conditions. Construction sector jobs are among the most hazardous in terms of work accidents and occupational diseases, even in the formal sector. Jobs are also often temporary rather than permanent, and there are often complex subcontracting arrangements. Particularly among informal workers, this makes for hazardous employment conditions (Poschen, 2015).

140. Working conditions and skill levels need to be improved if the construction sector is to create decent, well-paying jobs. However, skills development in building construction is also critical if high-performance efficiency goals for buildings are to be attained, as experiences in the United States and Australia show.

141. A study conducted in California showed that poorly installed equipment and materials fail to yield expected gains in efficiency and emission reduction. Market conditions led many employers to compete on the basis of cost rather than quality, which meant that workers were not adequately trained or paid, and labour turnover was high (IRLE, 2011). Similar lessons were learned in Australia's Home Insulation Programme. Concerns arose that some of the insulation installers did not possess adequate experience and qualifications. Close to 30 per cent of 13,800 roof inspections found installations with minor to serious deficiencies (OECD, 2012). Worker training is part of the remedy, but must be accompanied by better enforcement of building permits, codes and standards (Mattera et al., 2009). Skills upgrading and redesigning of work methods will also be needed to overcome traditional occupational health and safety hazards – such as exposure to asbestos, a legacy which needs to be dealt with in building renovation – and to prevent potential new hazards associated with new construction materials and methods.

**(e) Transportation<sup>37</sup>**

142. Transportation is a rapidly growing consumer of resources and a large emitter of GHGs. The sector employs an estimated 88 million workers globally: 8 million in motor vehicle manufacturing (with as many as 50 million jobs linked to vehicle manufacture, servicing and use); 26 million in rail and urban public transport; and 12 million in the air transport subsector. Greening the transportation sector entails a shift to more rail and public transportation, developing greater fuel efficiency in motor vehicles and air transport, a shift to alternative fuels, and a move from internal combustion to electric vehicles. Changing land-use policies and urban planning play a critical part in this context.

143. Greening the transportation sector is likely to see large-scale realignments of employment. Gains in jobs are possible through fuel efficiency and emission reductions (which require manufacturing of additional equipment). Expanding and modernizing electrical grids to accommodate a growing fleet of electric vehicles will also offer employment opportunities in construction. However, fuel efficiency improvements would also trigger job retrenchments in the motor vehicle fuel supply sector. In addition, a

<sup>37</sup> Except where otherwise noted, this section draws on ILO and ILS (2012), chapter 9.

significant rebalancing of transport modes implies job losses in the motor vehicle industry, while the public transportation sector, vehicle manufacturing, infrastructure construction, and system operations – and the bicycle sector – would gain jobs.

144. As is the case in the fossil fuel sector, there are ongoing changes in the motor vehicle industry that impact how many jobs exist in vehicle manufacturing, the quality of the jobs, and where they are located. Although global car fleets and car production are rising, labour productivity continues to improve and there is an increased tendency to outsource parts of the production process. These trends are likely to continue to exert pressure on employment in developed countries, especially since markets are shifting dramatically towards Asian markets. All of this implies regional shifts in employment. China, in particular, has risen to the top of the car-producing countries (Renner, 2015). In the United States, some car manufacturing has shifted from the traditional area around Detroit to the southern states, where union representation is lower or non-existent and wages are also lower. In Europe, there have been shifts to lower-wage locations in Eastern Europe.

145. **Fuel efficiency impacts, and hybrid and electric vehicles.** A study by Baum and Luria (2010) in the United States modelled the potential employment impacts of increasing fuel efficiency, including switching to diesel and hybrid-electric engines. A key assumption was that employment is directly proportional to the added cost of new fuel efficiency technology incorporated into future vehicles. The study found that by 2020, as many as 191,000 additional direct and indirect jobs could be created. Similarly, another study estimated likely job impacts under four different scenarios with annual fuel-economy improvements of 3, 4, 5 and 6 per cent per year during the period 2017–2025 (CERES, 2011). The study found that substantial job gains could be realized, ranging from about 350,000 to close to 700,000 jobs. However, the majority of gains would be realized outside the motor vehicle manufacturing industry, because fuel savings are reinvested in a range of products and services elsewhere in the economy.

146. **Public transport.** The number of underground railway systems worldwide has been on a sharp upward tick since the 1960s, when 31 systems were in operation. The number climbed to 101 systems in the 1990s and reached 157 in 2015, with the additions being mostly in Asia. In the past two decades, bus rapid transit (BRT) systems have also been attracting growing numbers of passengers. The number of BRT systems worldwide has grown to 195 in 2015, with most put in place in Brazil and other Latin American countries (Renner, 2016b).

147. A shift from a car-centred system to metropolitan public transit and intercity rail involves a starkly different employment structure. Far fewer rail, light rail and subway vehicles are needed than private cars. Therefore, the manufacturing of transit vehicles requires far fewer people than are employed in automobile production and servicing (and in fuel distribution). However, transit systems require a substantial workforce to operate and maintain them. No complete global employment figures appear to be available for the expansion of the systems mentioned above.

148. Renner and Gardner (2010) estimated at least half a million direct jobs in rail vehicle manufacturing worldwide. The number of jobs in the supply chain is unknown, but could double or triple this number. Urban public transit systems were estimated to employ 12.6 million people directly and indirectly worldwide in 2009 (UITP, 2011). About seven million people have jobs in operating freight and passenger railways (excluding indirect jobs).

149. **Redirection of fuel savings.** Embracing alternative modes of transport offers the prospect of a better trade balance for the many countries that depend on imported fuels (electric vehicles do not use any fuel, and public transit is far more fuel-efficient than cars

with internal combustion engines). The savings that become possible can be redirected to spending on other products and services in more labour-intensive sectors of the economy. Another consideration is that a transportation system that does not impose the massive health burdens associated with the present car- and truck-centred system frees up resources spent on treating illnesses for other, more productive, purposes. The upshot is an overall gain in employment.

150. **Bicycles.** Rebalancing the transportation system to make it more climate-compatible includes a larger modal share for bicycling. In some parts of the world, the bicycle sector already provides ample jobs. A study by the European Cyclists' Federation concludes that the continent's bicycle sector employs some 131,000 people (ECF, 2014). Manufacturing accounts for about 22,600 of these jobs; retail and repair for close to 81,000; cycling infrastructure for another 23,400; and cycle hiring schemes and other logistics for about 4,200. The study also found that bicycling supports some 524,000 jobs in tourism. The employment intensity in the bicycle industry (manufacturing, sales and infrastructure), measured as jobs per million euros in turnover, surpasses that of the motor vehicle industry.

151. Cycling and bicycle sharing have been gaining favour in cities around the world in recent years, which is translating to growing sales and an expanding bicycle infrastructure (bike lanes, and so on), and therefore into growing employment worldwide. The world's bicycle sharing fleet has grown from just 4,000 bicycles in six cities in 2000 to 806,000 bicycles in 712 cities in 2014 (Renner, 2016b).

152. **Aviation.** Aviation is fast-growing and thus a contributor to GHG emissions of growing proportions. Just in the last decade (2005–2014), annual passenger-kilometres increased by 57 per cent, while freight-kilometres grew by 26 per cent (ICAO, 2015). According to the International Council on Clean Transportation, the cumulative climate impact of aviation to date is equivalent to about 40 per cent of all surface transport modes (ICCT, undated). The sector is responsible for about 4 per cent of total GHG emissions.

153. Total aviation fuel use and CO<sub>2</sub> emissions have more than quadrupled since 1960 (reaching 700 million tonnes of CO<sub>2</sub> in 2012), and are likely to triple again by 2050. Average fuel use of new aircraft fell by about 45 per cent from 1968 to 2014, but improvements have fluctuated over time. Gains slowed noticeably after 1990, but returned to the long-term average rate of improvement after 2010 (Kharina and Rutherford, 2015). As is the case with automobiles, improving airplane fuel efficiency can be a source of additional employment for scientists and engineers. But other changes may have more mixed job impacts. Greening airline operational practices will require up-skilling of workforces. On the other hand, changing flight routing as a greening measure (prioritizing the shortest possible travel distances as opposed to less direct flight patterns dictated by airline hub strategies) would likely require fewer airline personnel. Increased use of biofuels in future years would have employment impacts in the energy sector.

## C. Consultation and social dialogue

154. Consultation and social dialogue among those most affected by climate change effects and policies are at the core of the just transition framework. Social dialogue and tripartism is not only one of the pillars of the Decent Work Agenda (see para. 42 above) but also one of key policy areas of the ILO guidelines. The role of dialogue to reach decisions by consensus, and to identify new business and employment opportunities and potential challenges as well as the need for adaptation of current skills and for new skills, has positioned consultation and tripartism as an essential element of labour relations around the world. In the context of climate change, social dialogue has been identified as an essential tool for anticipating and managing the effects of greening on the quality of work and

employment (Aumayr-Pintar, 2015). In the same way, certain countries have considered climate change related clauses in collective bargaining.

Box 2

**Green collective agreements in Canada**

As part of the Adapting Canadian Work and Workplaces to Respond to Climate Change project, an online database of green collective agreements has been developed from publicly available Canadian collective agreements. The database includes clauses related to climate change and low-carbon development. The clauses deal with green training and education, workplace environmental committees, recycling, commuting, green procurement, energy conservation, workforce adjustment and social responsibility. To date, 160 clauses have been compiled from the public service sector, steel and mining production, the railway sector, oil and gas production, energy and paper production, and other sectors.<sup>a</sup>

A total of 47 individual researchers and 24 partner organizations in four countries participate in the project to better understand how climate change impacts and policies may affect workplaces and the world of work in Canada.

Source: <<http://www.adaptingcanadianwork.ca>>.

<sup>a</sup> The database is available at <[https://www.zotero.org/green\\_agreements/items](https://www.zotero.org/green_agreements/items)>.

Box 3

**Analysis of environmental clauses of bargaining agreements in Australia**

In 2014 the Australian Department of Industry reported on the State of Knowledge on Climate Change, Work and Employment, commissioning a report *Climate Change and the Australian Workplace* on climate change clauses and collective agreements in Australia. The report analysed environmental clauses contained in 1,280 enterprise bargaining agreements registered across all sectors in Australia from 2009 to 2012.

The study found that the experience of the industries with the greatest commitment to collective bargaining over environmental issues, particularly tertiary education, was that employee voices can play an important role in facilitating ecological sustainability and climate change mitigation at the workplace level. The report also found that workplaces in high carbon intensive industries (such as mining, manufacturing, construction, transport and energy) lagged behind workplaces in low carbon intensive industries (such as public administration and tertiary education).

Source: Markey R, McIvor J and Wright CF. 2014. *Climate Change and the Australian Workplace*. Available at

<[http://www.businessandconomics.mq.edu.au/\\_data/assets/pdf\\_file/0014/336101/Climate\\_Change\\_and\\_The\\_Australian\\_Workplace\\_2014.pdf](http://www.businessandconomics.mq.edu.au/_data/assets/pdf_file/0014/336101/Climate_Change_and_The_Australian_Workplace_2014.pdf)>.

In Europe, the involvement of social partners in the green transition has been gradually increasing; however, much more still needs to be done. According to findings from a report by the European Commission on industrial relations and the green economy, social partners, trade unions and employers' associations are strongly involved in shaping the greening of the economy in northern and western EU member States such as Finland, Belgium and Germany. However, reinforcing and promoting social partners' activities at all levels (European, national, sectoral, regional and company) is crucial for the successful transition towards a green economy (European Commission, 2013). As the report shows, social partners are especially weak in green sectors, small companies and the self-employed sector.

155. Social dialogue can take place at the regional level (such as in Europe), at the national level, through cross-industry consultation or at the sectoral and company levels.



The purpose of the dialogue varies from merely consultation, to coordination of the implementation of a specific policy, to negotiation of binding agreements. The different modalities and aims are specified by national labour laws.

156. Coordination between different levels greatly varies from country to country. Some examples from Europe show this variation. In Sweden the system of social dialogue remains highly coordinated and specific agreements are used as a reference for subsequent agreements, while in other countries (such as Greece), the system is characterized by the radical breakdown of bargaining structures, in particular where collective bargaining principles have been revoked as a result of policy changes adopted to confront the recent economic crisis (Confrontations Europe, 2015). Those countries that maintained or reinforced social dialogue structures (such as Germany or Sweden) were able to make decisions by consensus, which led them to better cope with the socioeconomic impacts of the economic crisis. However, other countries adopted some measures that have weakened social dialogue structures or, where such structures were not well established, led to social unrest and further economic downturn. Similar consequences may be seen in the near and medium future in relation to climate change policies, particularly in the framework of the implementation of the Paris Agreement.

157. A prerequisite for social dialogue is respect for fundamental principles and rights at work, such as freedom of association and protection of the right to organize, enshrined in ILO Convention nos. 87<sup>38</sup> and 98.<sup>39</sup> It is also widely acknowledged that for social dialogue to be effective, two elements should be developed: the provision of technical capacity and adequate and updated information to stakeholders taking part in the dialogue process; and the need for consultation to take place on an ongoing basis. In this regard, facilitating technical capacity and information on the nature and socioeconomic effects of climate change and potential impacts on employment and incomes, on business competitiveness and on the overall economy are fundamental needs.

158. According to the ILO guidelines, governments should actively promote and engage in social dialogue to discuss the best means to implement national social, economic and environmental goals. Workers' and employers' organizations should be recognized as important partners in any climate change strategy. Joint union and management committees do exist at all levels in many countries throughout the world. Even though these existing structures were not necessarily set up to deal with climate change issues, they can be used for this purpose. The ILO Convention no. 144<sup>40</sup> provides guidelines on how to set up consultative procedures and structures, and highlights the participation of governments, workers and employers in this work at the national level (ILO, 2010b).

159. One example of such involvement is South Africa's Green Economy Accord, signed by several government departments, representative trade unions and employers' organizations, and civil society organizations (Department of Economic Development et al., 2011). The accord aims at developing local industrial capacity in green sectors and creating 300,000 new green jobs by 2020 in order to address concerns about climate change through a partnership to promote a green economy. Targeted sectors include renewable energy manufacturing and installations, energy efficiency, recycling, retrofitting of buildings, green transport (including electric vehicles) and biofuel production.

160. Recently, a stakeholder consultation including both trade unions and business organizations on the national INDC has been carried out in South Africa.<sup>41</sup> The

<sup>38</sup> Freedom of Association and Protection of the Right to Organise Convention, 1948 (no. 87).

<sup>39</sup> Right to Organise and Collective Bargaining Convention, 1949 (no. 98).

<sup>40</sup> Tripartite Consultation (International Labour Standards) Convention, 1976 (no. 144).

<sup>41</sup> See the draft report, prepared for the stakeholder consultation, at [https://www.environment.gov.za/sites/default/files/docs/sapositionfor\\_cop21\\_0.pdf](https://www.environment.gov.za/sites/default/files/docs/sapositionfor_cop21_0.pdf).

Government of South Africa has made a commitment to address the socioeconomic implications of its INDC, stating that “any negative impacts on employment need to be avoided and will be studied empirically as further mitigation measures are put in place.”

161. Brazil developed its INDC in consultation with civil society organizations, including the main trade unions and business organizations. The consultation process was divided into two phases (an online questionnaire and face-to-face meetings) that culminated in the final version of the INDC.<sup>42</sup> The consultation process showed the diverse range of views of civil society organizations in terms of objectives, priorities and the implementation of measures to be undertaken, and therefore the need to negotiate to reach a common position supported by all.

162. Chile, the Dominican Republic, Mexico, Peru, Zimbabwe and other countries have held public consultations with the participation of both trade unions and business organizations.<sup>43</sup> It should be noted that, in some of these cases, the lack of sufficient technical resources or human capacity within trade unions, employers’ associations or both have prevented a full assessment of the employment consequences of INDCs and of identifying adequate measures to address potential impacts. This points to a need for greater capacity-building of social partners.

163. The ILO guidelines recommend social partners “to promote active participation in social dialogue at enterprise, sectoral and national level to assess opportunities and resolve challenges posed by the transition”. A good example of such efforts is the dialogue undertaken by the German trade union IG Metall. Up to 16,000 new jobs were created in the wind turbine sector in 2013, taking the total new jobs created in that year to 137,800. However, works councils, which are the structures in charge of social dialogue at the company level, did not exist in all companies along the supply chain in the wind energy sector. A number of decent work deficits (e.g. lower wages than the sectoral average; long working hours; a high level of casual work, especially among young workers) were present in these companies, but these factors could not be negotiated on because of the lack of social dialogue structures. To address these deficits, IG Metall ran a three-year campaign aiming to increase the number of works councils in all companies in the wind energy sector so as to be able to enhance working conditions. This process led to the creation of works councils that was a first step in reaching company-level agreements to assess the decent work deficits (Sustainlabour Foundation, 2014; Noblet, 2015).

164. Employers’ organizations also have a strong role in promoting active participation of their members in social dialogue at enterprise, sectoral and national levels in order to assess opportunities and resolve challenges posed by the transition. In Spain, for example, a public–private skills initiative in Navarre created a public training centre for renewable energy (CENIFER) that contributed to an increase in electricity production from renewables from zero to 65 per cent of the total in 15 years. In the 1980s and 1990s, the Spanish region of Navarre suffered from a severe economic downturn when high oil prices impaired the competitiveness of its single large industrial employer, a Volkswagen car plant. Unemployment soared to a peak of 13 per cent in 1993. The regional government responded with active industrial policy measures, including worker retraining, to expand the renewable energy sector. A rapid and successful development of a wind power industry followed, facilitated by the favourable geographical and climatic conditions of the region alongside a clear corporate and public strategy. The region expanded the share of its electricity production derived from renewable sources to 65 per cent, with an eventual

---

<sup>42</sup> For more information about this social dialogue process see <<http://blog.itamaraty.gov.br/consulta-clima>>.

<sup>43</sup> For information about the public consultation see <<http://portal.mma.gob.cl/consultacontribucion/>>.

target of 100 per cent. This small region of Spain, with a population of just 620,000, is now Europe's sixth largest producer of wind power.

165. From 2002 onwards, Navarre has been implementing its Environmental Training Plan. In cooperation with the Confederation of Entrepreneurs of Navarre and the Navarre Industry Association, the regional government identified the main skills shortages in the region through a project entitled "Strategic talent in the renewable energy sector", and on the basis of its findings set up CENIFER, which became a major training provider for the sector. In 2006, the country's first graduate programme for electrical engineers in wind and solar electricity was launched at the Public University of Navarre. Between 2002 and 2006, employment in renewable energies across Navarre increased by 183 per cent. In 2007 alone, 100 companies and over 6,000 jobs in renewable energies were created. Unemployment dropped to 4.76 per cent. Even in the economic and employment downturn of 2009 Navarre maintained the lowest unemployment level in Spain. This achievement bears witness to the success of a policy mix which incorporated environmental and skills measures in a proactive response to an economic crisis with a view to long-term dynamic development (ILO, 2011d).

166. Another example comes from India. In 2007 the Federation of Indian Chambers of Commerce and Industry established a Climate Change Task Force (CCTF) representing various sectors: carbon advisory, cement, coal bed methane, financial, forestry and land, management, fluorinated gases, legal, oil and gas, pulp and paper, state government, thermal power, urban transport, waste management and wind power. The CCTF's objectives were: to develop an industry position on climate change; to look at measures by industry towards climate change mitigation; and to develop a consensus on policy, regulatory and fiscal measures that would be required to formulate effective mitigation strategies. A report presented in 2007, called for a comprehensive National Climate Change Policy based on the review of national policies and including macro-level policy recommendations. The CCTF placed great emphasis on sectoral measures, calling for government-backed incentives and tax depreciation on investments to stimulate cleaner and more sustainable products. R&D recommendations for GHG mitigation and energy security constitute another important section of the report, which greatly contributed to raising awareness among Indian stakeholders. The core suggestions were: to achieve energy security while ensuring harmony with the environment; to improve resource recovery during extraction of energy sources; to encourage more R&D aimed at harnessing clean and renewable sources of energy; and to improve energy efficiency of industry and transport.

#### **D. Training and skills development<sup>44</sup>**

167. Many studies conclude that skills shortages already pose a major problem for the transition to greener, climate-compatible economies and thus for job creation. Moreover, this is a problem that is likely to grow in coming years. Poschen (2015) warns that with a lack of skilled and motivated workers in green growth sectors, hopes for creating a climate-compatible economy may not materialize. Shortages are the result of a number of factors, including (Strietska-Ilina et al., 2011):

- (a) Underestimates of the pace at which certain green sectors grow;
- (b) A general shortage of scientists and engineers (and specifically, an underrepresentation of women in science, technology, engineering and medicine, which affects their prospects in a fast-growing field like renewable energy);
- (c) A poor reputation or limited attractiveness of some economic sectors;

---

<sup>44</sup> Except where otherwise noted, this section draws strongly on Strietska-Ilina et al. (2011).

(d) Shortages of teachers and trainers proficient in fast-growing sectors such as renewable energy and energy efficiency.

168. Strietska-Ilina et al. (2011) explain that “the challenge for skills development policy is to integrate environmental awareness and the right technical training for green jobs into education and training provision.” Marrying these two objectives is essential, but difficult. Country studies compiled in the report revealed that, while coordination between climate and environmental and skills policies can be comprehensive in some cases, it is fragmented or practically non-existent in others. There is often a lack of cross-ministerial coordination. Efforts by educational authorities to anticipate, identify and provide skills do not typically include inputs from environment ministries. Conversely, education and training institutions are typically not involved in shaping climate policies. In addition, safety and health issues are typically addressed separately.

169. Apart from ensuring that enough labour market entrants acquire the skills needed for the economy of tomorrow, another challenge lies in the need to retrain existing workers, in particular to meet current and evolving market needs. This can be difficult for older workers and especially for low-skilled workers, as it will be difficult for them to ‘skill up’ and compete for new jobs. There is also a spatial challenge in that low-carbon economy jobs may be created in locations very different from those suffering job losses. Education and training efforts therefore need to be linked with a just transition policy. Disadvantaged workers and communities will need targeted assistance, and perhaps remedial education or preferential treatment to ensure they are not left behind.

170. The needed degree of skills change in the workforce ranges from virtually none in some cases (minor changes within a given industry) to high (in the case of entirely new industries and occupations). The most typical case, however, is likely to be somewhere in the middle (where existing jobs are altered because of the adoption of new technologies or workplace methods).

171. Learning or improving certain core skills is likely to be of greater relevance for a person’s employability than skills that are highly specific to certain occupations or technologies. Competencies in literacy and numeracy, as well as in decision-making, teamwork and communication, are critical in that they affect people’s ability to function well in teams, thus enhancing their adaptability and their occupational mobility.

## 1. Multilevel action

172. Crucial to the success of education and training efforts is that governments (at all levels), trade unions and employers all do their share, and coordinate their efforts. Social dialogue is essential. Countries of course vary in terms of how well-developed their education and training systems are, and how responsive they are to the need to incorporate climate and environmental considerations into training programmes. But some general observations can be made at different levels of education and training action:

(a) **Individual enterprise-level** training efforts tend to provide the fastest and most effective responses in developing skills that match company-specific needs. However, their impact for the economy as a whole remains, of necessity, limited;

(b) Efforts at the **industry level**, coordinated through skills councils or chambers of commerce, have been shown to be very effective in several countries (an example is found in France’s construction sector, which launched Qualit’ENR, a programme to develop training standards for the installation of renewable energy equipment, in 2006);

(c) At the **government level**, various ministries may be involved in designing and setting up programmes through the existing formal education and training system. Universities, technical schools or specialized training centres typically play a key role in

their implementation. However, such approaches are often unresponsive to fast-evolving industry needs (which can be the result of poor communication channels or of institutions' slow and cumbersome procedures to develop new skill programmes);

(d) An alternative that has proven to be effective is partnerships that combine governmental resources with the hands-on knowledge of relevant skills of employers' associations and trade unions. For example, such tripartite structures in vocational training in Denmark and Germany have ensured that curriculums reflect needed conditions and circumstances. In Spain's province of Navarre, a training centre for renewable energy (CENIFER) was created that underpinned and facilitated the rapid rise in electricity production from renewables (see paras. 161 and 162 above).

173. For the purpose of being able to anticipate skills needs, it would be helpful to set up a standardized approach to identifying green occupations. The United States had briefly done so in 2010–2013 under the aegis of the Bureau of Labor Statistics (BLS, undated),<sup>45</sup> but the effort soon fell victim to federal budget cuts. Still, it is generally far easier to monitor skills needs in developed countries, which have well-established general economic classification systems, than it is in most developing countries.

## 2. Transferability of skills

174. One of the major challenges in moving towards a low-carbon economy is enabling workers in declining industries to find new jobs and livelihoods. However, at least some sets of skills and know-how from occupations in polluting industries are applicable to careers in climate-friendly sectors. For instance, there are overlaps between the conventional and renewable energy industries.

175. CBI (2012) has argued that skills in the United Kingdom's offshore oil and gas sector are relevant to the development of wind turbine manufacturing. There are also similarities in occupational profiles between oil drilling and geothermal development. Further, the skills of electrical engineers, electrical technicians, electricians and information technology specialists employed in operating fossil fuel power stations can be adapted to operating renewable power plants (EC and ILO, 2011).

176. Another instructive example of skills being repurposed for new industries comes from Germany. A substantial number of former shipyard workers (many of whom lost their jobs to competition from Asia) found new jobs in building bases and towers for offshore wind farms. From an engineering and skills perspective, the know-how of the shipbuilding industry can be applied to wind infrastructure, and existing skill sets have allowed for successful retraining (Fornahl et al., 2012; Hülsen, 2012).

177. One possible employment alternative for displaced coal workers is the solar industry. In the United States context, Louie and Pearce (2016) found that solar growth can, in principle, absorb all coal workers laid off during the next 15 years. Their study examined occupational patterns, skill sets and salaries in both industries, with the intention of determining the closest equivalent position. Following retraining, technical-level workers would earn more in the solar industry than they had previously in the coal sector, but managers and executives would earn less (Pearce, 2016).

178. To make the switch, coal industry employees need to acquire new skills in a number of ways, from taking short courses or on-the-job training to pursuing a multi-year degree (for those in engineering positions). To estimate potential retraining costs, Louie and Pearce (2016) examined two scenarios. The best-case scenario assumes that only workers with

<sup>45</sup> The goal of the BLS green jobs initiative was to develop information on: "(1) the number of and trend over time in green jobs, (2) the industrial, occupational, and geographic distribution of the jobs, and (3) the wages of the workers in these jobs."

coal-specific positions need retraining – 35 per cent of coal miners and 43 per cent of coal power plant employees. Estimated costs range from USD 181 million to USD 649 million. Under the worst-case scenario, all coal miners would require reskilling, with costs of USD 539 million to USD 1.9 billion required to make a switch to solar-related positions.

179. For affected individuals, the cost of retraining could well be a significant and perhaps even an insurmountable financial burden. But state or federal governments could establish public retraining programmes. Alternatively, Louie and Pearce (2016) suggest an industry-financed “Coal Employee Retraining Fund” akin to the 1977 Surface Mining Control and Reclamation Act (which mandates that companies pay into a federal fund for reclamation of abandoned mine land). The authors point out that even at their highest estimate, retraining costs amount to only 5 per cent of coal’s annual GDP contribution, and they argue for such a course of action in the light of the massive subsidies the industry has received over the years.

180. ILO Convention no. 142<sup>46</sup> provides an essential framework for reducing the mismatch in the level of skills in labour markets with employment needs. ILO recommendation no. 195<sup>47</sup> recognizes lifelong learning as crucial for both the competitiveness of enterprises and the employability of workers.

181. When it comes to accessibility of training, especially for workers to acquire new skills on clean processes and technologies, educational leave might be necessary. Such should take into account the family needs of both women and men, for instance by the leave being offered at times and locations compatible with family roles. In order for workers to be able to attend such training it would also have to be paid for so as not to be a financial burden on the employees. ILO Convention no. 140<sup>48</sup> is useful on this issue (ILO, 2014a).

### **3. Regional development**

182. Skills building and retraining may take place in the context of regional economic development strategies. A number of efforts have targeted the renewable energy sector and have been motivated by the desire to overcome problems brought on by crises in older industries or a lack of economic diversification. Examples include the United States, where wind energy development has been seen as a way to inject new life into many abandoned “rustbelt” industrial facilities in Pennsylvania and Ohio, though with somewhat mixed results. In Québec, Canada, a centre for turbine maintenance helped reduce unemployment in the Gaspé peninsula triggered by crises in the area’s fisheries, forestry and mining sectors. Wind and solar development have similarly helped economically struggling regions of Portugal. In neighbouring Spain, the provincial government of Navarre struck a tripartite agreement with businesses and labour unions in favour of an active industrial policy (see paras. 161–162 above), of which wind energy development was a key element (IRENA, 2012).

183. Where necessary, the relocation of workers can be promoted by a variety of actors – industry, governments or public-private partnerships. Poschen (2015) recounts experiences in dealing with worker redundancies in the sugar cane industry in Brazil, the forestry industry in China, the fishing industry in Norway and the steel industry in the United Kingdom. In all cases, diversification and the creation of alternative employment were keys to success.

---

<sup>46</sup> Human Resources Development Convention, 1975 (no. 142).

<sup>47</sup> Human Resources Development Recommendation, 2004 (no. 195).

<sup>48</sup> Paid Educational Leave Convention, 1974 (no. 140).

## E. Social protection and security

184. Social protection constitutes one of the pillars of a just transition framework. Only 20 per cent of the world's population has adequate social security coverage and more than half lacks any coverage at all. The majority of the world's economically active population does not benefit from any protection in cases of unemployment, work-related injury or maternity. Nearly half of all people over pensionable age do not receive a pension, and for those who do, pension levels are often inadequate (ILO, 2016).

185. Informality of work is common in the majority of the sectors most affected by climate change impacts, such as agriculture, fisheries, forestry and tourism. It is also very frequent in economic sectors that are essential to achieving low-carbon development such as waste management and recycling, construction, and small-scale industries in all industrial sectors. Providing access to social protection measures to workers in these sectors should be an integral part of any climate change policy. Successful strategies to extend social protection coverage to informal workers include: creating cooperatives and partnerships with local and private actors (e.g. waste management and recycling in Brazil and India); providing ad hoc social protection infrastructures for informal workers in a particular sector (e.g. mobile pre-school services for rural workers in India and child-care centres for seasonal agriculture workers in Chile); formalizing microfinance programmes for MSMEs (e.g. agriculture workers in Burkina Faso); providing mobile information offices to access workers and MSMEs in remote areas (e.g. green construction in Zambia); and developing voluntary codes of conduct and changes in regulations, simplifying tax rules and strengthening labour inspection regimes. Such strategies have been applied successfully in the Dominican Republic, El Salvador and Honduras, among many other countries (ILO, 2014b).

186. Over recent years, social protection has gained the attention of international agreements and development policies because of its significant contribution to poverty eradication, gender equity and the promotion of social inclusion and sustainable development. A number of international instruments pertain to social security:

- (a) ILO recommendation No. 202, Social Protection Floors, 2012;
- (b) The Sustainable Development Goals adopted in 2015: extending social protection will be essential to achieve SDG 1 (end poverty), SDG 8 (inclusive and sustainable growth and decent work for all) and SDG 10 (reducing inequality within and among countries);
- (c) The Global Flagship Programme on Building Social Protection Floors for All, part of ILO's overall Development Cooperation Strategy (2015–2017), adopted in 2015 by the ILO Governing Body.

187. There is increasing interest in linking social protection policies and climate change policies because of the dual need for enhancing resilience of workers and their families in times of climate disasters, and facilitating their ability to cope with the consequences of climate change. In addition, social protection can serve as a safety net in times of economic transformation away from high carbon emitting sectors towards the production of low-carbon services and products. The IPCC Fifth Assessment Report highlights the importance of assessing the synergies among social protection policies, social development strategies, and disaster risk reduction strategies and climate policies (IPCC, 2014).

188. A social protection policy that adequately integrates climate change impacts should strengthen the adaptive capacity of the poor and vulnerable both before and after climate change events. This includes precautionary measures to limit exposure to various risks as

well as mechanisms for compensation in cases of lost or reduced livelihood (Canonge and De, undated).

189. Mitigation policies may have a negative impact on businesses and workers in high carbon emitting sectors such as coal mining, fossil fuel energy production and inefficient industry, while new green, low-carbon sectors may benefit. In these cases, formulating accompanying policies through social protection, including unemployment insurance and benefits, skills training and upgrading, workforce redeployment, and other appropriate measures to support enterprises and workers in sectors negatively impacted by the transition to sustainable development should be part of the policy mix (ILO, 2015b). An important consideration in the formulation of such social protection policies and measures is the issue of affordability, sustainability and adaptability for both ILO's member States and employers in those countries.

190. Climate change policies aiming at reducing GHG emissions should be carefully assessed, and the employment and social consequences adequately understood before implementation. According to ILO estimations, between 2010 and 2015 overall, 100 governments in 78 developing and 22 high-income countries were reducing or removing subsidies, predominately on fuel, but also on electricity, food and agriculture.

#### Box 4

##### **How has the removal of fuel subsidies in Egypt affected its people and the climate?**

In Egypt, spending on fuel subsidies was a drain on public finances. In 2013, Egypt spent about 20 per cent of its budget on fuel subsidies. The social welfare provided by these subsidies is skewed towards the rich, who consume more fuel and therefore capture more of the subsidies' value. Subsidies also keep prices artificially low, encouraging waste and even the black-market sale of fuel. Reducing the subsidies was proposed to balance the budget and to target wasteful consumption. Prices for consumers increased, and government savings financed new protections for the most vulnerable.

Lifting of subsidies has greater negative impacts upon poorer households in relative terms. Poorer households have fewer opportunities for substitution, making them more dependent upon the subsidy scheme than their counterparts in higher income categories.

To address these negative impacts on poorer households, the government introduced two new cash transfer programmes (the Takaful and Karana programmes) with some of the savings gained from the removal of the fuel subsidy. One provides assistance to poorer households with additional benefits available for children, and the other provides social pensions for those with disabilities or who are aged 65 and above. In addition, Egypt has outlined a series of environmental measures to combat the effects of climate change by shrinking its own carbon footprint (investments in renewable energy sources, including design of solar and wind infrastructure).

Both social protection programmes were designed using a principle of leaving the beneficiaries no worse off than they were under the subsidy regime. However, additional analysis of household consumption and income data would be necessary to determine whether cash benefits are fully, or only partially, mitigating the effects of price increases, or if they provide further protection.

New tools for measuring the welfare effects of climate-related policies are needed to facilitate the transition to greener societies. Clearer guidance on offsetting measures is needed to ensure that those affected by the subsidy reform are better off as a result of the policy.

*Source:* ILO. 2014. *Social Protection and Climate Change*. Available at <<http://www.social-protection.org/gimi/gess/RessourcePDF.action?ressource.ressourceId=53569>>.



191. The adjustment measures referred to in paragraph 190 above were implemented at a time when food and energy prices were hovering near record highs; if basic subsidies are withdrawn without compensation being provided through adequate social protection mechanisms, food and energy may become unaffordable for many households, in particular, but not only, for the poorest ones. In Indonesia, the reform of the fuel subsidy system raised prices between 30 to 100 per cent. To address the impact of such a subsidy reform on lower income households, universal fuel subsidies were replaced with targeted food subsidies, such as the Beras Miskin or “rice for the poor” programme. Targeted health insurance and assistance for families with students in school were also introduced alongside reforms (Canonge 2016a, b and c).

192. In 60 reported countries, the lack of proper compensation to households suffering from the changes to the subsidies has led to public demonstrations (Ortiz et al., 2013; Zaid et al., 2014 cited in ILO Social Protection Department, 2014). Within the framework of social protection, other important policy implications should also be considered:

(a) Developing a social protection system takes a long time, particularly in countries where institutional capacity is limited. Therefore, mitigation actions with potential social impacts should be taken only once the potentially affected population is protected and compensation measures through adequate social protection are in place;

(b) The large cost savings resulting from mitigation policies should allow countries to develop comprehensive social protection systems. For example, in Ghana, the eliminated fuel subsidy would have cost over USD 1 billion in 2013, whereas the targeted Livelihood Empowerment Against Poverty programme costs about USD 20 million per year. Since 2010, 100 governments have been considering removing food and fuel subsidies and replacing them with safety nets targeted to the poor, including 31 countries in sub-Saharan Africa, 22 in high income countries, 12 in East Asia and the Pacific, 11 in Latin America, 9 in the Middle East and North Africa, and 6 in South Asia;

(c) Mitigation policies may have complex social impacts that need to be properly assessed and discussed within the framework of national dialogue. Involving tripartite constituents in the definition and implementation of social protection measures is a key element to ensuring a fair and efficient policy result, where negative socioeconomic impacts are well addressed;

(d) Taxing natural resource extraction could offer great potential for many developing countries. Norway’s approach of taxing oil profits and storing the revenues in the Government Pension Fund Global is perhaps the best-known case, although the transferability of this approach to other countries may not be automatic and depends on national contexts. Developing countries provide several innovative examples of channelling natural resource revenue streams for social protection (Hujo, 2012; OECD, 2014 cited in ILO Social Protection Department, 2014).

## **F. Post assessment of just transition measures and their sustainability**

193. Little research and discussion has been done on this final element of the just transition process. Assuming that governments follow (part of) the guidance provided by this paper for a just transition of its national workforce affected by its mitigation policies or actions, then: the assessment of the impacts is done prior to the implementation of a policy; social dialogues are conducted effectively, taking into account the concerns of the employers and the workers; re-education and training programmes have been set up; and plans for the proper compensation for affected workers and their families are in place. At the end of the process of transition it is important to apply post assessment of the effect of

this transition to draw on lessons learned, be they good or bad. Such assessments could include answers to the following questions:

(a) Was the assessment of impacts made prior to the implementation accurate? Were any elements missing? Were any elements unnecessarily considered?

(b) Was the amount of consultation and social dialogue sufficient or more than necessary? What were the reactions of the participants?

(c) Were the resources planned for re-education and training sufficient? Did the redevelopment of the skills of the affected workers succeed as planned in terms of both the result of redevelopment and the resources spent? Did the resources correspond to the labour market needs?

(d) Did the social protection policy put in place sufficiently address the needs of all affected workers and their families? Is there space for adjustment to improve the efficiency of the resources and to better benefit those who receive the protection measures? Are the social protection measures adopted affordable, sustainable and adaptable?

194. The purpose of such assessments for future planning is twofold: from the point of view of the affected workforce and enterprises, such assessments can provide input to better address their risks and needs; from the point of view of governments, the assessments identify whether this experience of just transition has effectively addressed all the needs and concerns, as well as identifying what could have been done better and what was redundant.

## **II. The way forward**

### **A. Key messages and concluding remarks**

195. A global transition towards a low-carbon and sustainable economy has both positive and negative impacts on employment. Generally, output and employment in low-carbon industries and services will grow, while energy- and resource-intensive sectors are likely to stagnate or contract. The transition challenges play out against the backdrop of significant, and rising, global unemployment, while poor job quality and working poverty afflict many of those who do have work. But delaying the transition is not an option: unless urgent mitigation and adaptation measures are taken, climate disruptions will cause significant job losses and tougher working conditions.

196. Under the UNFCCC, the issue of just transition is dealt with as one of the social impacts of climate policies and actions. So far, the impacts of the implementation of mitigation policies and actions have been considered and addressed mainly from the perspective of environmental and economic implications. The social aspects of the impacts have received less attention and consideration from governments while implementing their climate mitigation policies and actions. The Paris Agreement states that Parties to it should take into account the imperatives of a just transition of the workforce and the creation of decent work and quality jobs in accordance with nationally defined development priorities.

197. From a conceptual perspective, employment will be affected in four ways as climate policies reorient the economy towards greater sustainability: job creation, job substitution, job elimination and job transformation. The scale and extent of these changes depends on the speed and breadth of technological and market changes in the green transformation. Policymakers must smooth the edges of this transformation by developing just transition policies for affected workers, enterprises and their communities.

198. The employment impacts of a shift towards a climate-compatible economy are, most directly, a result of changes in government policy. Policy changes translate to changes in investments, trade and productivity.

199. Policy responses to climate change will necessitate important structural transformations that will affect national economies, enterprises, workers and communities. Most studies that have investigated the net impact of environmental policy measures on employment suggest it is positive. However, the risk of job losses should not be underestimated. Job losses are likely to occur in economic sectors, regions and communities, particularly where a dependence on fossil fuel resources is significant and where opportunities for economic diversification are limited. The situation is also challenging if the shift in demand of occupations is in a sector which holds a large share of employment for the region (e.g. agriculture). Such concerns are particularly strong among (but not limited to) developing countries.

200. The transition towards inclusive green economies must be fair, maximizing opportunities for economic prosperity, social justice, rights and social protection for all, leaving no one behind.

201. The greening of economies in the context of sustainable development and poverty eradication will require a country-specific mix of macroeconomic, industrial, sectoral, social protection, skills, social dialogue and labour policies that create an enabling environment for sustainable enterprises to prosper and create decent work opportunities by mobilizing and directing public and private investment towards environmentally sustainable activities.

202. The aim should be to generate decent jobs all along the supply chain, in dynamic, high value added sectors which stimulate the upgrading of jobs and skills, as well as job creation and improved productivity in more labour-intensive industries that offer employment opportunities on a wide scale.

203. Skills development is the key for successful transition of the workforce and creation of decent jobs, especially in certain sectors such as energy, building and transport. The establishment of higher education institutions and technology centres lays the foundations of a knowledge-based economy as an alternative to a coal- and steel-centred economy.

204. A successful transition for affected workers, enterprises and communities, which entails efforts to diversify affected local, regional or national economies, build relevant knowledge, expertise and supply chains, provide training or reskilling programmes, and offer adequate interim support (relocation aid and social protection measures), is a long-term task.

## **B. Possible elements of the work programme of the improved forum on the impact of the implementation of response measures**

205. This paper has reviewed the work carried out in the area of just transition with a focus on the improved forum's objective; therefore, this section aims to present some suggestions for consideration by Parties during their discussion on future work elements in this area under the improved forum.

206. The work of the improved forum within the area of just transition may inform and support Parties in designing their national policy frameworks that would aim to minimize loss of employment while enhancing opportunities for job creation, decent work and social inclusion.

207. In view of the limited experience in applying a framework for just transition, there is a need to undertake additional analytical work to assist developing country Parties in their just transition initiatives. This may include:

- (a) Reviewing national experiences through country case studies;
- (b) Reviewing sectoral experiences through case studies in specific sectors (e.g. mining, fossil fuels, energy-intensive industries and agriculture);
- (c) Identifying and promoting existing national and international guidelines in relation to just transition and decent work.

208. For the discussion to identify priority areas to advance work on just transition, Parties may consider:

- (a) The use of existing tools and methodologies for the assessment of the impacts of mitigation policies and actions on the workforce;
- (b) The use of social dialogue processes to guide and orient the identification of priority areas of work on just transition, drawing upon analytical and research findings to inform a dialogue among governments and social partners;
- (c) Conducting an assessment of the most efficient mitigation policies and measures, taking an integrated approach to the social, economic and environmental dimensions.

209. ILO, constituting governments, and workers' and employers' organizations approved the key guiding principles for just transition towards environmentally sustainable economies and societies for all. During the discussion on collaboration, Parties may consider:

- (a) Adopting the ILO guidelines and agreeing on pilot applications of the guidelines and other regulatory frameworks that can support countries in the integration of decent work and just transition in the implementation of their climate change commitments;
- (b) Fostering international cooperation with international institutions including ILO and workers' and employers' organizations as well as other public, private and civil society organizations in a position to support national action and inform the process of global negotiations;
- (c) Building the capacity of Parties, and working with relevant organizations with a dedicated work programme in this field, including, among others, the International Training Centre of ILO.

## References

- ACF (Australian Conservation Foundation) and ACTU (Australian Council of Trade Unions). 2009. *Creating Jobs – Cutting Pollution: The Roadmap for a Cleaner, Stronger Economy*. Melbourne, Australia.
- Adapting Canadian Work and Workplaces (ACW) website*. Available at <<http://www.adaptingcanadianwork.ca/about-3/>>.
- Aumayr-Pintar C. 2015. *The Greening of Social Dialogue: Ensuring the Quality of Work and Employment in the Transition to a Green Economy*. Presentation at European Parliament Hearing (Brussels). Eurofound. European Observatory of Working Life. Available at <[http://www.europarl.europa.eu/meetdocs/2014\\_2019/documents/empl/dv/20150324\\_presentation\\_eurofound\\_/20150324\\_presentation\\_eurofound\\_en.pdf](http://www.europarl.europa.eu/meetdocs/2014_2019/documents/empl/dv/20150324_presentation_eurofound_/20150324_presentation_eurofound_en.pdf)>.
- Baum A and Luria D. 2010. *Driving Growth: How Clean Cars and Climate Policy Can Create Jobs*. March 2010. Washington, DC, Natural Resources Defense Council, United Auto Workers and Center for American Progress.
- BLS (Bureau of Labor Statistics, United States). Undated. *Measuring Green Jobs*. Available at <<http://www.bls.gov/green>>.
- BP. 2016. *BP Statistical Review of World Energy*. June 2016. Available at <<http://www.bp.com/statisticalreview>>.
- Buildings Performance Institute Europe. 2011. *Europe's Buildings under the Microscope*. Brussels.
- Canonge J. 2016a. *Social Protection and Climate Change. How are rural workers and residents in China faring with conservation efforts?* ILO Social Protection Department Publication.
- Canonge J. 2016b. *Social Protection and Climate Change. Can Brazil pursue twin social and environmental objectives together?* ILO Social Protection Department Publication.
- Canonge, J. 2016c. *Social Protection and Climate Change. How has the removal of fuel subsidies in Egypt affected its people and the climate?* ILO Social Protection Department Publication.
- Canonge J and De L. Undated. *Together, to Change Millions of Lives in the Transition Towards Greener Economies and Societies*. Geneva, International Labour Organization.
- CBI (Confederation of British Industry). 2012. *The Colour of Growth: Maximising the Potential of Green Business*. London, p. 6. Available at <[http://www.cbi.org.uk/media/1552876/energy\\_climatechangerpt\\_web.pdf](http://www.cbi.org.uk/media/1552876/energy_climatechangerpt_web.pdf)>.
- CERES. 2011. *More Jobs per Gallon: How Strong Fuel Economy/GHG Standards Will Fuel American Jobs*. July 2011. Washington, DC.
- Chateau J, Saint-Martin A and Manfredi T. 2011. Employment impacts of climate change mitigation policies, in *OECD: A General-Equilibrium Perspective*. OECD Environment Working Paper No. 32. Paris, OECD.
- Confrontations Europe. 2015. *Overview of the Social Dialogue in Europe*. Available at <<http://confrontations.org/interface-en/interface-104-en/overview-of-the-social-dialogue-in-europe/?lang=en>>.

Department of Economic Development, Ministry of Energy, Ministry of Transport, BUSA and COSATU. 2011. *South Africa Green Economy Accord*. Available at <<http://www.economic.gov.za/communications/publications/green-economy-accord>>.

Department of Environmental Affairs of South Africa. 2012. *A National Climate Change Response. White Paper*. Pretoria, South Africa. Available at <[http://www.gov.za/sites/www.gov.za/files/national\\_climatechange\\_response\\_whitepaper\\_0.pdf](http://www.gov.za/sites/www.gov.za/files/national_climatechange_response_whitepaper_0.pdf)>.

Der Spiegel. 2007. “End of an Industrial Era: Germany to Close its Coal Mines,” 30 January 2007. Available at <<http://www.spiegel.de/international/end-of-an-industrial-era-germany-to-close-its-coal-mines-a-463172.html>>.

Deutsche Bank Climate Change Advisors and Rockefeller Foundation. 2012. *United States Building Energy Efficiency Retrofits: Market Sizing and Financing Models*. New York.

EASHW (European Agency for Safety and Health at Work). 2011. *Foresight of New and Emerging Risks to Occupational Safety and Health associated with New Technologies in Green Jobs by 2020: Phase II—Key Technologies*. Luxembourg.

EC (European Commission) and ILO. 2011. *Skills and Occupational Needs in Renewable Energy*. Geneva, International Labour Organization.

ECF (European Cyclists’ Federation). 2014. *Cycling Works. Jobs and Job Creation in the Cycling Economy*. Brussels. Available at <[http://www.tmluven.be/project/jobcreationcycling/141125%20Cycling%20Works%20-%20Jobs%20and%20Job%20Creation%20in%20the%20Cycling%20Economy\\_ECF%20document.pdf](http://www.tmluven.be/project/jobcreationcycling/141125%20Cycling%20Works%20-%20Jobs%20and%20Job%20Creation%20in%20the%20Cycling%20Economy_ECF%20document.pdf)>.

ECLAC (Economic Commission for Latin America and the Caribbean). 2010. The employment situation in Latin America and the Caribbean, in *ECLAC/ILO Bulletin*, No. 4, December 2010.

European Commission. 2013. *Industrial Relations in Europe 2012*. DG Employment, Social Affairs and Inclusion. Luxemburg. Available at <<http://ec.europa.eu/social/main.jsp?catId=738&langId=en&pubId=7498>>.

European Commission. 2016. *The Road from Paris: Assessing the Implications of the Paris Agreement and Accompanying the Proposal for a Council Decision on the Signing, on behalf of the European Union, of the Paris Agreement adopted under the United Nations Framework Convention on Climate Change*. Brussels, Belgium. Available at <<https://ec.europa.eu/transparency/regdoc/rep/1/2016/EN/1-2016-110-EN-F1-1.PDF>>.

Fornahl D, Hassink R, Klaerding C, Mossig I and Schröder H. 2012. *From the Old Path of Shipbuilding onto the New Path of Offshore Wind Energy? The Case of Northern Germany*. Available at <[http://druid8.sit.aau.dk/acc\\_papers/16vikj17dhajdhyxsi7vymf446q.pdf](http://druid8.sit.aau.dk/acc_papers/16vikj17dhajdhyxsi7vymf446q.pdf)>.

Friends of the Earth. 2011. *Is a Just Transition to a Low-Carbon Economy Possible Within Safe Global Carbon Limits? A report by Friends of the Earth England, Wales & Northern Ireland*. Available at <[https://www.foe.co.uk/sites/default/files/downloads/just\\_transition.pdf](https://www.foe.co.uk/sites/default/files/downloads/just_transition.pdf)>.

Galgóczy B. 2014. “The Long and Winding Road from Black to Green. Decades of Structural Change in the Ruhr Region,” in *International Journal of Labour Research*. Vol. 6, Issue 2, pp. 217–240.

Government of Germany. Undated. *CO<sub>2</sub> – Gebäudesanierung – Energieeffizient Bauen und Sanieren*. Available at <[http://www.bundesregierung.de/Webs/Breg/DE/Themen/Energiewende/Energiesparen/CO2-Gebauesanierung/\\_node.html](http://www.bundesregierung.de/Webs/Breg/DE/Themen/Energiewende/Energiesparen/CO2-Gebauesanierung/_node.html)>.

- Greenpeace International, Global Wind Energy Council and SolarPowerEurope. 2016. *Energy [R]evolution: a Sustainable World Energy Outlook 2015*. Available at <<http://www.greenpeace.org/international/en/campaigns/climate-change/energyrevolution/>>.
- Gueye MK, Fyfe AM, Olsen L and Tsukamoto M. 2015. Decent Jobs in a Safe Climate: ILO Solutions for Climate Action. Geneva, International Labour Organization. <[http://www.ilo.org/global/topics/green-jobs/publications/WCMS\\_374304/lang-en/index.htm](http://www.ilo.org/global/topics/green-jobs/publications/WCMS_374304/lang-en/index.htm)>.
- Gueye MK. 2016. Create Green Jobs to Realize the Benefits of Low Emission Development. LEADS Global Partnership. *LEADS in Practice*. June 2016. <[http://ledsgp.org/wp-content/uploads/2016/06/CDKN\\_LEADS\\_CB\\_Employment\\_final\\_revised\\_27-6-16\\_web-res.pdf](http://ledsgp.org/wp-content/uploads/2016/06/CDKN_LEADS_CB_Employment_final_revised_27-6-16_web-res.pdf)>.
- Herren H, Bassi A, Tan B and Binns W. 2011. *Green Jobs for a Revitalized Food and Agriculture Sector*. Rome: FAO.
- Hülsen I. 2012. German Shipyards See Future in Wind Power. *Spiegel Online*, 30 August. Available at <<http://www.spiegel.de/international/business/german-shipyards-see-future-in-wind-power-a-850368.html>>.
- ICAO (International Civil Aviation Organization). 2015. *The World of Air Transport in 2014*. Appendix 1. Available at <[http://www.icao.int/annual-report-2014/Documents/Appendix\\_1\\_en.pdf](http://www.icao.int/annual-report-2014/Documents/Appendix_1_en.pdf)>.
- ICCT (International Council on Clean Transportation). Undated. “Programs/Aviation”. Available at <<http://www.theicct.org/aviation>>.
- ICLEI. 2014. *Bottrop, Germany. InnovationCity Ruhr – Model City Bottrop*, ICLEI Case Study No. 169, March.
- ILO and ILS (International Institute for Labour Studies). 2012. *Working Towards Sustainable Development: Opportunities for Decent Work and Social Inclusion in a Green Economy*. Geneva, International Labour Organization.
- ILO and OECD (Organisation for Economic Co-operation and Development). 2012. *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, Mexico, 17–18 May 2012.
- ILO Regional office for Asia. 2016. *Promoting and building social protection in Asia (3rd phase): Extending social security coverage in ASEAN*.
- ILO Social Protection Department. 2014. *Social Protection Global Policy Trends 2010–2015. From Fiscal Consolidation to Expanding Social Protection: Key to Crisis Recovery, Inclusive Development and Social Justice*. Geneva, International Labour Organization. Available at <[http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms\\_319641.pdf](http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/publication/wcms_319641.pdf)>.
- ILO. 2010a. *The Impact of Climate Change on Employment: Management of Transitions Through Social Dialogue. Case Study of Social Dialogue Roundtables on the Effects of Compliance with the Kyoto Protocol on Competitiveness, Employment and Social Cohesion in Spain*. Geneva, International Labour Organization.
- ILO. 2010b. Climate Change and Labour: The Need for a “Just Transition”. *International Journal of Labour Research*. 2(2).

- ILO. 2011a. *Social Protection Floor for a Fair and Inclusive Globalization*. Report of the Social Protection Floor Advisory Group (Bachelet report). Geneva, International Labour Organization.
- ILO. 2011b. *World Social Security Report 2010/11: Providing Coverage in Times of Crisis and Beyond*. Geneva, International Labour Organization.
- ILO. 2011c. *Promoting Decent Work in a Green Economy*. Geneva, International Labour Organization.
- ILO. 2011d. *Greening the global economy – the skills challenge*. Geneva, International Labour Office.
- ILO. 2012a. *The Global Impact of e-waste: Addressing the Challenge*. Available at <[http://www.ilo.org/sector/Resources/publications/WCMS\\_196105/lang--en/index.htm](http://www.ilo.org/sector/Resources/publications/WCMS_196105/lang--en/index.htm)>.
- ILO. 2012b. *Promoting Safety and Health in a Green Economy*. Available at <[http://www.ilo.org/safework/info/promo/WCMS\\_175600/lang--en/index.htm](http://www.ilo.org/safework/info/promo/WCMS_175600/lang--en/index.htm)>.
- ILO. 2013. *Sustainable Development, Decent Work and Green Jobs*. International Labour Conference, 102<sup>nd</sup> Session, Report V. Geneva, International Labour Organization.
- ILO. 2014a. *A Just Transition for All: Can the Past Inform the Future*. Available at <[http://www.ilo.org/wcmsp5/groups/public/---ed\\_dialogue/---actrav/documents/publication/wcms\\_153352.pdf](http://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---actrav/documents/publication/wcms_153352.pdf)>.
- ILO. 2014b. *Transitioning from the Informal to the Formal Economy*. Report V to the 103<sup>rd</sup> Session of the International Labour Conference. Geneva, International Labour Organization. Available at <[http://www.ilo.org/wcmsp5/groups/public/---ed\\_norm/---relconf/documents/meetingdocument/wcms\\_218128.pdf](http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---relconf/documents/meetingdocument/wcms_218128.pdf)>.
- ILO 2015a. *Guidelines for a Just Transition Towards Environmentally Sustainable Economies and Societies for All*. Available at <[http://www.ilo.org/global/topics/green-jobs/news/WCMS\\_422575/lang--en/index.htm](http://www.ilo.org/global/topics/green-jobs/news/WCMS_422575/lang--en/index.htm)>.
- ILO. 2015b. *Global Flagship Programme on Building Social Protection Floors for All*. Geneva, International Labour Organization. Available at <<http://www.social-protection.org/gimi/gess/RessourcePDF.action?ressource.ressourceId=51737>>.
- ILO. 2016. *World Employment Social Outlook: Trends 2016*. Geneva, International Labour Organization.
- IPCC (Intergovernmental Panel on Climate Change). 2014. *5th Assessment Report. Synthesis report*. Available at <<https://www.ipcc.ch/report/ar5/syr/>>.
- IRENA (International Renewable Energy Agency). 2012. *Energy Access and Jobs*. Abu Dhabi.
- IRENA. 2014. *Renewable Energy and Jobs: Annual Review 2014*. Abu Dhabi.
- IRENA. 2015. *Renewable Energy and Jobs: Annual Review 2015*. Abu Dhabi.
- IRENA. 2016. *Renewable Energy and Jobs: Annual Review 2016*. Abu Dhabi.
- IRLE (Institute for Research on Labor and Employment). 2011. *California Workforce Education and Training Needs Assessment for Energy Efficiency, Distributed Generation, and Demand Response*. Berkeley, CA.
- ITUC (International Trade Union Confederation). 2010. Resolution on combating climate change through sustainable development and just transition. 2<sup>nd</sup> ITUC Congress. Vancouver, Canada. Available at <<http://www.ituc-csi.org/resolution-on-combating-climate?lang=en>>.



- ITUC, We Mean Business, The B Team, The international alliance of Catholic development agencies, Friends of the Earth, Action Aid, Greenpeace, Christian Aid, WWF and Oxfam International. 2015. *Call for Dialogue: Climate Action Requires Just Transition*. Joint declaration. Available at <<http://www.ituc-csi.org/call-for-dialogue-climate-action>>.
- Jaeger CC et al. 2009. *Wege aus der Wachstumskrise*. Potsdam, European Climate Forum.
- Jung W. 2008. “From Industrial Area to Solar City: The Gelsenkirchen Experience”. Presentation at Rovigo Conference, 2–4 April. Available at <[http://rovigo2008.iclei-europe.org/fileadmin/template/events/rovigo2008/files/Presentations/2\\_t3\\_Jung\\_web.pdf](http://rovigo2008.iclei-europe.org/fileadmin/template/events/rovigo2008/files/Presentations/2_t3_Jung_web.pdf)>.
- Kharina A and Rutherford D. 2015. *Fuel Efficiency Trends for New Commercial Jet Aircraft: 1960 to 2014*. Washington, DC, ICCT.
- Louie EP and Pearce JM. 2016. “Retraining Investment for U.S. Transition from Coal to Solar Photovoltaic Employment. *Energy Economics*. Available at <<http://doi:10.1016/j.eneco.2016.05.016>>.
- Mattera P. 2009. *High Road or Low Road? Job Quality in the New Green Economy*. Washington, DC, Good Jobs First.
- Ministry of External Affairs of Brazil. 2015. *Participação da Sociedade Civil no processo de preparação da contribuição nacionalmente determinada do Brasil ao novo acordo sob a Convenção-Quadro das Nações Unidas sobre Mudança do Clima*. Available at <<http://blog.itamaraty.gov.br/consulta-clima>>.
- Morison J, Hine R and Pretty J. 2005. *Survey and Analysis of Labour on Organic Farms in the UK and Republic of Ireland*. International Journal of Agricultural Sustainability.
- Namuwoza C and Tushemerirwe H. 2011. *Uganda: Country Report*. Available at <<http://www.organic-world.net/fileadmin/documents/yearbook/2011/namuwoza-tushemerirwe-2011-uganda.pdf>>.
- Navigant Research. 2015. “Global Building Stock Database. Commercial and Residential Building Floor Space by Country and Building Type: 2013–2023”. Available at <<https://www.navigantresearch.com/research/global-building-stock-database>>.
- Noblet C. 2015. “Germany: green jobs do not always mean good jobs”, *Equal Times*. Available at <<http://www.equaltimes.org/germany-green-jobs-do-not-always?lang=es#.V8RBNVt96Uk>>.
- OECD. 2012. *The Jobs Potential of a Shift Towards a Low-Carbon Economy*. Final Report for the European Commission, DG Employment, Paris.
- Pearce JM. 2016. “What If All U.S. Coal Workers Were Retrained to Work in Solar?” *Harvard Business Review*, 8 August. Available at <<https://hbr.org/2016/08/what-if-all-u-s-coal-workers-were-retrained-to-work-in-solar>>.
- Pollin R, Garrett-Peltier H, Heintz J and Hendricks B. 2014. *Green Growth. A U.S. Program for Controlling Climate Change and Expanding Job Opportunities*. Center for American Progress and Political Economy Research Institute, University of Amherst.
- Poschen P. 2015. *Sustainable Development, Decent Work and Green Jobs*. Sheffield, Greenleaf Publishing.
- Räthzel N and Uzzell D (ed). 2013. *Trade Unions in the Green Economy*. Working for the Environment. Routledge.
- REN21. 2016. *Renewables 2016 Global Status Report*. Paris.
- Renner M. 2015. “Auto Production Sets New Record, Fleet Surpasses 1 Billion Mark”, in *Vital Signs. The Trends that are Shaping our Future*. Washington, DC, Island Press.

- Renner M. 2016a. “Reducing the Environmental Footprint of Buildings,” in Worldwatch Institute, *State of the World 2016*. Washington, DC.
- Renner M. 2016b. “Supporting Sustainable Transportation”, in *State of the World 2016*. Washington, DC, Island Press.
- Renner M and Gardner G. 2010. *Global Competitiveness in the Rail and Transit Industry*. Worldwatch Institute, Apollo Alliance, and Northeastern University Washington, DC.
- Rosemberg A. 2010. “Building a Just Transition. The Linkages between Climate Change and Employment,” *International Journal of Labour Research*. Vol. 2 Issue 2, pp. 125–162.
- Sharma S and Pandove A. 2010. “Organic farming in Punjab: an economic analysis”, in *Political Economy Journal of India*. January 2010. Available at <<http://www.thefreelibrary.com/Organic+farming+in+Punjab%3A+an+economic+analysis.-a0227797570>>.
- Solar Foundation. 2016. *National Solar Jobs Census 2015. A Review of the U.S. Solar Workforce*. Washington, DC.
- Solarstadt Gelsenkirchen. Undated. Available at <<http://www.solarstadt-gelsenkirchen.de/en/>>.
- Statistik der Kohlenwirtschaft. 2015. *Der Kohlenbergbau in der Energiewirtschaft der Bundesrepublik Deutschland im Jahre 2014*. Herne and Köln.
- Strietska-Ilina O, Hofmann C, Durán Haro M and Jeon S. 2011. *Skills for Green Jobs. A Global View*. International Labour Office.
- Sustainlabour Foundation. 2014. *Sustainable Energy: Renewable Energy Companies That Respect Workers’ Rights*. Available at <<http://www.sustainlabour.org/noticia.php?lang=EN&idnoticia=706>>.
- SVTC (Silicon Valley Toxics Coalition). 2009. *Toward a Just and Sustainable Solar Energy Industry*. San Jose, CA.
- SVTC. 2014: *2014 Solar Scorecard*. San Jose, CA.
- Syndex S Partner and WMP. 2009. *Climate Disturbances, New Industrial Policies and Ways Out of the Crisis*. Brussels, ETUC.
- Tirado R. 2010. *Picking cotton: The Choice Between Organic and Genetically-Engineered Cotton for Farmers in South India*. Greenpeace International. Available at <<http://greenpeace.in/safefood/wp-content/uploads/2010/06/Picking-Cotton.pdf>>.
- Trabish HK. 2011. *The Multibillion-Dollar Value of Energy Service Companies*. 31 October 2011. Available at <<http://www.greentechmedia.com/articles/read/The-Multi-Billion-Dollar-Value-of-Energy-Service-Companies/>>.
- Tumushabe G, Ruhweza A, Masiga M and Naturinda B. 2007. *Integrated Assessment of Uganda’s Organic Agriculture Subsector: Economic Opportunities and Policy Options to Mitigate Negative Socio-Economic and Environmental Impacts*. Kampala: Advocates Coalition for Development and Environment.
- UITP (International Association of Public Transport). 2011. “Employment in Public Transport: 13 Million People Worldwide!”
- UNCTAD (United Nations Conference on Trade and Development) and UNEP. 2008. *Organic Agriculture and Food Security in Africa*. New York and Geneva.
- UNEP (United Nations Environment Programme). 2011. *Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication*. Nairobi.

UNEP, ILO, IOE (International Organisation of Employers) and ITUC (International Trade Union Confederation). 2008. *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*. Nairobi.

United Nations. 2015. *Sustainable Development Goals. 17 Goals to Transform Our World*. Available at <<http://www.un.org/sustainabledevelopment/poverty/>>.

Ürge-Vorsatz D et al. 2010. *Employment Impacts of a Large-scale Deep Building Energy Retrofit Programme in Hungary*. Budapest, Central European University.

We Mean Business. 2015. *About We Mean Business*. Available at <<http://www.wemeanbusinesscoalition.org/about>>.

World Bank. 2010. *The Cost to Developing Countries of Adapting to Climate Change: New Methods and Estimates*. Global Report of the Economics of Adaptation to Climate Change Study, consultation draft. Washington, DC.

World Coal Institute. 2005. *The Coal Resource: A Comprehensive Overview of Coal*. London.

Yan S. 2016. China Plans to Cut 1.8 Million Coal and Steel Jobs. *CNN Money*, 29 February. Available at <<http://money.cnn.com/2016/02/29/news/economy/china-steel-coal-jobs/>>.

Zambia Green Jobs Programme. 2016. *More Than Business Alone: Extending and Promoting Social Protection Amongst MSMEs and Informal Workers in Zambia's Building Construction Industry*.

---