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Employment Prospects in the Green Economy: Myth and Reality

1. Framing the issue

The issue of the employment opportunities provided by the 'green economy' has been much debated among the experts in the field in recent years¹. In this connection, the 1997 White Paper on renewables issued by the European Commission marked a turning point at European level². In planning a set of measures aimed at promoting renewable energy, policymakers were aware of its potential in terms of employment, although the concept of the green economy was not yet widely established.

Whereas, in the past, green jobs were not widely promoted, except in Spain³ and Germany⁴, they have now become a key objective, and public awareness has been raised.

The present study is based on the international research project Women in Renewable Energy Sector (WiRES), set up by ADAPT – the Association for International and Comparative Studies in Labour Law and Industrial Relations, in collaboration with the Faculty of Law of the University of Szeged Hungary and the Union for Private Economic Enterprise (UPEE) Bulgaria and co-funded by the European Commission, DG Employment, Social Affairs and Equal Opportunities, Budget heading 04.03.03.01, Industrial Relations and Social Dialogue. Sections 3 and 4 were drafted by Lisa Rustico, ss 1, 2, and 5 by Michele Tiraboschi.

¹ For literature review about green jobs, see ADAPT, *Employment Perspectives of the Green Economy and the Impact on the Labour Market – Literature Review Updated in 2010*, at www.adapt.it, *Green Jobs*.

² European Commission, Communication from the Commission, *Energy for the Future: Renewable Sources of Energy. White Paper for a Community Strategy and Action Plan*, at www.adapt.it, *Green Jobs*, 1997. The European Commission argues that 'the development of renewable energy sources can actively contribute to job creation, mainly among small and medium enterprises', 4, and that 'a proactive move towards such energy sources will lead to significant new employment opportunities', 13.

³ With reference to Spain, see Fundación Biodiversidad, Observatorio de la Sostenibilidad en España, *Empleo Verde en una Economía Sostenible*, at www.adapt.it, *Green Jobs*, 2010. The Spanish government started to address the issue of the employment impact of sustainable development policies about ten years ago. See the study commissioned by the Spanish Ministry of Environment in 1998 when Spain had more than 219,382 employees in 'green' activities, 1.55% of the Spanish working population at that time: Ministerio de Medio Ambiente y Medio Rural y Marino, *Estimación del Empleo Ambiental en España*, 2000.

⁴ DB Climate Change Advisors, *Creating Jobs and Growth – The German Green Experience*, at www.sustainableprosperity.ca/files/German%20Green%20Experience%20Jobs%20and%20Growth.pdf, last accessed on 30 Sep. 2010.

The US administration⁵ publicly acknowledged the importance of the green economy as an instrument to tackle the financial crisis starting in 2008, and since, then more and more consideration has been given to the sector, viewed also as a means to promote employment.

In addition to its potential in terms of employment, the green economy responds to other major concerns to be faced by policymakers in the coming years, such as the need for renewable energy sources and the control of pollution, reflecting their commitment to combat climate change.

Accordingly, the measures in the Kyoto Protocol, as well as those laid down in the 2000 Millennium Development Goals of the United Nations, focus on the environment at a global level. In Europe, the '20-20-20' provision contained in the Climate and Energy Package⁶ lays down mandatory norms aimed at reducing greenhouse gas emissions and encouraging a more efficient use of energy, as specified also by the Directive on energy from renewable sources in 2009⁷. In addition, with the European institutions⁸ renewing their commitment in this respect, national governments have made an effort to harmonize environmental policies and employment programmes⁹, also with regard to taxation¹⁰.

⁵ See the American Recovery and Reinvestment Act 2009. See also A. Barboni, M. Zagordo (eds.), *Gli effetti della crisi economica sul mercato del lavoro statunitense. Proposte e soluzioni per il rilancio dell'occupazione*, *Special Adapt Bulletin*, 5 February 2009, no. 3. For an assessment of the effects of the Clean Energy Jobs and American Power Act on the labour market, see Congressional Budget Office, S. 1733, Clean Energy Jobs and American Power Act, www.adapt.it, *Green Jobs*, 16 December 2009.

⁶ The Energy and Climate Package, adopted by the European Parliament on 17 December 2008, responds to the commitment undertaken by the European Council to tackle climate change and promote renewable energies. The Package, based on an EU system of exchange emissions quotas, sets binding targets in terms of CO₂ emissions reduction in the sectors not included in the European emissions quota exchange system and utilization of the renewable energy sources.

⁷ Directive 2009/28/EC of the European Parliament and the Council of 23 April 2009 on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC, in GUUE, 5 June 2009, L 140/16, at www.adapt.it, *Green Jobs*. The Directive sets a common framework for the promotion of renewable energy sources and establishes binding national targets for the share of energy from renewables in relation to gross energy consumption and for the share of energy from renewables in transport.

⁸ The Commission started promoting climate actions and strategies some twenty years ago, and the first Community strategy to limit CO₂ emissions and improve energy efficiency dates back to 1991. However, Member States and the European Union are called to significant efforts to comply with the Kyoto Protocol's requirements and those set out by the Commission in 2000 and 2005, through the *Climate Change European program*, <http://ec.europa.eu/environment/climat/eccp.htm>. See also Green Paper from the Commission to the Council, the European Parliament, the European Economic and Social Committee, and the Committee of the Regions, *Adapting to Climate Change in Europe – Options for EU Action*, COM (2007) 354, 29 June 2007; European Commission, White Paper, *Adapting to Climate Change: Towards a European Framework for Action*, COM (2009) 147, 1 April 2009.

⁹ European Commission, *Commission Staff Working Document on the Links between Employment Policies and Environment Policies*, SEC 2005, 1530, at www.adapt.it, *Green Jobs*, 17 November 2005. See also European Commission, *Environment and Employment: Building Sustainable Europe*, COM 97 592 final. The key points of this communication were later transposed into the Employment Guidelines of 1998. European Council, *Employment Guidelines*, Resolution of 15 December 1997.

¹⁰ On this point, the Commission, by regarding the environmental tax reform as possible driver for the creation of new jobs, used the expression 'double dividend' to highlight the trade-off between employment and environmental targets; in European Commission, *Commission Staff Working Document on the links, etc.*, *supra*. On the relation between environmental/energy taxation and job creation, see C.J. Heady et al., *Study on the Relationship between Environmental/Energy Taxation and Employment Crea-*

In the coming years, environmental policies are expected to promote the creation of high-quality jobs and the setting up of green companies using either traditional or innovative technology¹¹. However, differences in the implementation of standards can cause cost differentials to widen in the European countries. In this connection, the European¹² Trade Union Confederation (ETUC) estimates that a considerable number of businesses that are more exposed to international competition will resort to outsourcing, with negative effects on employment and the quality of the work.

However, a number of studies undermine this argument. Spain, for instance, is regarded as a reference point in the quest for renewable energies, despite some critical research findings. According to a survey carried out by the Rey Juan Carlos University in Madrid on the effects that alternative sources of energy have on employment, every 'green job' created in Spain resulted in the elimination of 2.2 other jobs¹³. The research also showed that in 2000, the Spanish government allocated EUR 0.5 million to fund the creation of each job in the green economy and EUR 1 million for each new job in the wind energy sector.

The promotion of 'green' job opportunities has been widely supported by public funding and by a number of measures aimed at tackling the international financial crisis¹⁴, which will soon entail growing competition, affecting not only levels of employment but also pay scales and legislation regulating work. As pointed out by the International Labour Organization (ILO)¹⁵, major concerns about green jobs refer to developing countries and the ongoing phenomenon of dumping, which might lead to an increase

tion, study prepared for the European Commission, Directorate General XI, at www.adapt.it, *Green Jobs*, 2000. The Environmental Programme of the United Nations defines 'double dividend' as the positive result of reaching environmental targets and creating employment. See United Nations Environment Program (UNEP), International Labour Organization (ILO), *supra*, 10. The International Labour Organization adopted the same expression with reference to environment and employment. Cf. 'Green Policies and Jobs: A Double Dividend?' in ILO, *World of Work Report 2009, The Global Jobs Crisis and Beyond*, Ch. IV, 97 et seq., at www.adapt.it, *Green Jobs*.

¹¹ See, among many, N. Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007), esp. summary of conclusions xvii, on the basis of which 'action on climate change will also create significant business opportunities, as new markets are created in low-carbon energy technologies and other low-carbon goods and services. These markets could grow to be worth hundreds of billions of dollars each year, and employment in these sectors will expand accordingly'.

¹² European Trade Union Confederation (ETUC), ISTAS, SDA, Syndex, Wuppertal Institute, *Climate Change and Employment 2007. Impact on Employment in the European Union-25 of Climate Change and CO₂ Emission Reduction Measures by 2030* (hereinafter 'ETUC, *Climate Change and Employment*'), www.adapt.it, *Green Jobs*. See also ITUC, *Trade Unions and Climate Change. Equity, Justice & Solidarity in the Fight Against Climate Change*, 2009; *Les syndicats et le changement climatique*, www.adapt.it, *Green Jobs*, November 2009.

¹³ G.A. Calzada, R.M. Jara & J.R. Rallo Julián, *Study of the Effects on Employment of Public Aid to Renewable Energy Sources* (Madrid: Universidad Rey Juan Carlos, 2009), www.adapt.it, *Green Jobs*.

¹⁴ In relation to measures in response to the economic crisis, see UNEP, *Global Trends in Sustainable Energy Investment* (2009); HSBC, *A Climate for Recovery* (February 2009); Deutsche Bank, *Investing in Climate Change 2009. Necessity and opportunity in turbulent times* (October 2008); O. Edenhofer & N. Stern, *Towards a Global Green Recovery Recommendations for Immediate G20 Action* (Foreign Office of the German Government, April 2009); UNEP, *Global Green New Deal* (March 2009). See also Organization for Economic Co-operation and Development (OECD), *Green Growth: Overcoming the Crisis and Beyond* (Paris: OECD, 2009), www.adapt.it, *Green Jobs*.

¹⁵ See, among the others, the United Nations Environment Program report, UNEP, ILO report, *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*, www.adapt.it, *Green Jobs*, 2008.

of existing social inequalities with industrialized countries. As a result, future research¹⁶ should focus on the real employment impact of the green economy.

In order to lay the foundations for further investigation, the aim of this paper was to provide an overview of the debate-taking place at an international level on the relationship between the green economy and the labour market, also considering industrial relations perspectives.

2. The problem of the definition of green jobs and their impact on the labour market

The expression 'green jobs' is used to refer to occupations that promote the protection of the environment. This also means considering the effects on the labour market of company restructuring as the result of investment in the green economy and the subsequent process of adaptation¹⁷. The ILO and the United Nations Environment Programme (UNEP) adopt the following definition of green jobs:

positions in agriculture, manufacturing, construction, installation, and maintenance, as well as scientific and technical, administrative, and service-related activities, that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect and restore ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency and avoidance strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution. But green jobs... also need to be good jobs that meet long standing demands and goals of the labour movement, i.e., adequate wages, safe working conditions, and worker rights, including the right to organize labour unions¹⁸.

The international literature¹⁹ shows that green jobs can be classified on the basis of the area and the sector, with a focus on building, transport, and manufacturing²⁰, as well as food, agriculture, and forestry. However, the literature does not provide a universally recognized definition of the term, covering all production sectors and employment grades and a wide range of skills relating to environmental protection²¹, also due to a blurring of boundaries²² between some occupations.

¹⁶ See G. Rossi, *Premesse economiche: perché investire nei settori eco-sostenibili? Presentazione delle ragioni economiche che promuovono l'occupazione nei settori verdi*, www.adapt.it, *Green Jobs*.

¹⁷ It is important to note the difference between, on the one hand, 'mitigation' strategies, which include all measures addressed to the mitigation of the negative impact that human activities have on the environment, by reducing the intensity of the coal energy use, for instance, establishing industrial standards to increase energy efficiency in production processes – definition was taken from OECD, *Climate Change Mitigation* (Paris: OECD, 2008), 11 – and on the other hand, 'adaptation' strategies, including actions undertaken to reduce the inevitable negative consequences of climate change and to exploit positive opportunities, e.g., the use of scarce water resources – definition was taken from OECD, *Economic Aspects of Adaptation to Climate Change: Costs, Benefits and Policy Instruments* (Paris: OECD, 2008), 1.

¹⁸ UNEP, ILO, *Green Jobs: Towards Decent Work*, *supra*, 36.

¹⁹ See literature review in n. 1.

²⁰ For an in-depth examination of the eco-industry, see European Commission, DG Environment, *Eco-industry, Its Size, Employment, Perspectives and Barriers to Growth in an Enlarged EU* (Ernst and Young, September 2006).

²¹ The US Bureau of Labor Statistics has recently undertaken a series of interviews with researchers and experts, aimed at defining green jobs on the basis of the firm's economic activity, evaluating whether and

The lack of a shared definition, together with different approaches to the data²³, highlights the difficulty of making a quantitative or qualitative assessment of the effects of the green economy on employment. Most of the studies make a positive assessment²⁴, alternatively opting for a neutral position²⁵, suggesting that negative effects are less likely.

The Organization for Economic Co-operation and Development (OECD) has conducted a series of studies²⁶ that are worthy of note, focusing on the outcomes of a more recent investigation dealing with the employment impact of the green economy, according to which the effects of the environmental policies were slightly significant²⁷. A 2004 survey²⁸ highlighted the fact that, although they have a considerable impact in the short-run at sectoral level, the results of CO₂ reduction policies are uncertain²⁹.

According to ILO, estimates³⁰ in 2005 restructuring associated with mitigation policies involved 38% of workers in high-energy intensity sectors³¹, for a total of 600,000 workers worldwide. In confirming the existing data, the study found that green policies could increase employment rates by 0.5 to 1.1 percentage points over a period of five

how the economic outcome of work can be aimed at the protection or restoration of the environmental balance.

²² Some authors talk of an 'irradiation' effect for which 'green' economic activities have the potential of greening other economic sectors. In other words, 'the creation of green employment in key parts of the economy has the potential to "radiate" across large swaths of the economy, thus greening commensurately large sections of the total workforce', in UNEP, ILO, 2008, *supra*, 38.

²³ For a comprehensive analysis of the environmental impact assessment measures, see G. Rossi, 'Job Creation and Job Losses Related to Green Investments: An Overview of the Current Debate', in C. Stagnaro (ed.), *The Impact of Green Investments on Labour Market*, Dossier ADAPT, 16 July 2009 n. 9, www.adapt.it, *Green Jobs*.

²⁴ In this perspective, see WWF, *Low Carbon Jobs for Europe. Current Opportunities and Future Prospects* (2009). See also among many, S. Fankhauser, F. Seheiler, & N. Stern, *Climate Change, Innovation and Jobs*, *Climate Policy* 8 (2008): 421-429.

²⁵ See, for a different view, among many, R.D. Morgestern, W.A. Pizer & J.S. Shih, 'Jobs Versus the Environment: An Industry-Level perspective', *Journal of Environmental Economics and Management* 43 (2002): 412-436; see also the OECD, *Environmental Policies and Employment* (Paris: OECD, 1997), confirmed in OECD, *Environment and Employment: An Assessment*, Working Party on National Environmental Policy, ENV/EPOC/WPNP200311/FINAL, www.adapt.it, *Green Jobs*, 17 May 2004.

²⁶ Since the 1970s, the OECD has carried out a number of studies on the employment impact of environmental policies: the first literature studies date back to 1978, OECD, *Employment and Environment* (1978). In the 1990s, Member States encouraged a new study, due to the high employment rates www.oecd.org/document/55/0,3343,en_2649_34405_35142967_1_1_1_1,00.html.

²⁷ OECD, *Environmental Policies and Employment* (Paris: OECD, 1997), the outcomes of which are confirmed in OECD, *Environment and Employment etc.*, *supra*, where the lack of macroeconomic studies that consider employment as an important indicator for the evaluation of environmental policies is also highlighted.

²⁸ This research considers the results of a 1997 study, further developing the analysis of the environment effects on employment, distinguishing between positive and negative effects, direct and indirect effects, short- or long-term effects, temporary and sustainable effects, effects leading to part-time or full-time jobs, effects that create new jobs while maintaining the old ones, OECD, *Environment and Employment etc.*, *supra*, 9.

²⁹ OECD, *Environment and Employment etc.*, *supra*, 73.

³⁰ ILO, Institute of Labour Statistics, *World of Work Report 2009. The Global Jobs Crisis and Beyond*, ILO, ILS, Geneva, 2009, 100.

³¹ For a classification of the high carbon intensity sectors, see ILO, ILS, 'Annex A. Estimating the Size of the High Carbon Intensive Sectors', in ILO, Institute of Labour Statistics, *World of Work Report 2009, supra*.

years³², thus having only a marginal impact. However, the combination of environmental policies and measures supporting innovation in technology could provide higher levels of employment: 2.6 million new jobs in the most industrialized countries, 14.3 million worldwide³³.

The adoption of legislative provisions³⁴, as well as the allocation of public funds, should drive innovation further. It could also contribute to raising aggregate demand for goods and services and to a positive effect on employment³⁵. In this connection, the energy sector seems to offer the brightest prospects in terms of job opportunities³⁶.

UNEP³⁷ provided different figures, suggesting that in 2030, there will be 20 million workers employed in the energy sector worldwide, compared to 2.3 million in the sector in 2006, of which 300,000 were in wind energy; 170,000 were in photovoltaic energy; 600,000 were in solar thermal energy; and 1.2 million were in the biomass sector. According to the European Commission³⁸, the number of employees in the renewable energy sector was 1.4 million, with 640,000 in the biomass sector; 180,000 in wind energy; and 55,000 in photovoltaic energy, amounting to 0.64% of the total workforce. In Europe, a million new jobs are expected to be created in renewable energy by the end of 2010³⁹.

Other studies by European institutions have predicted that 240,000 additional jobs will be created by 2020, taking into account a number of factors including higher levels of unemployment in the traditional energy sectors, together with 0.24% growth in GDP⁴⁰.

However, research by Greenpeace and the European Renewable Energy Council suggests that technological innovation in renewable energy production will contribute to the creation of 2.7 million new jobs in the sector over the next twenty years⁴¹.

³² *Ibid.*, 102.

³³ For a classification of the high carbon intensity sectors, see ILO, ILS, 'Annex A. Estimating the Size of the High Carbon Intensive Sectors', *supra*, 104.

³⁴ On the risks arising from the interaction of different instruments in environmental policy packages, see OECD, *Green Growth: Overcoming the Crisis and Beyond* (Paris: OECD, 2009), 11, www.adapt.it/GreenJobs.

³⁵ See R. Torres, 'The Social Impact of Policies to Address Climate Change: A Review of the Issue', *International Labour Review* 147, no. 2-3 (2008).

³⁶ Among the studies on the energy sector, see D. Kammen, K. Kapadia, & M. Frupp, *Putting Renewables to Work: How Many Jobs Can the Clean Energy Industry Generate?*, Energy Resources Group, Goldman School of Public Policy, University of California, Berkeley, 2004. For the wind energy sector, see M.I. Blanco & G. Rodrigues, 'Direct Employment in the Wind Energy Sector: An EU Study', *Energy Policy* 37(2009): 2847-2857. However, econometric analysis underlines the moderate impact of renewable energy sector policies on economic growth in Europe, attributing positive employment effects to the increase of energy costs caused by a greater technology use to produce energy from renewable sources. See Fraunhofer ISI Germany, Ecofys the Netherlands, Energy Economics Group EEG Austria, Rütter + Partner Socioeconomic, Européenne d'Économie SEURECO France, *EmployRES. The Impact of Renewable Energy Policy on Economic Growth and Employment in the European Union*, Karlsruhe, www.adapt.it/GreenJobs, 27 April 2009.

³⁷ UNEP, ILO, 2008, *supra*, 127

³⁸ European Commission, *Meeting the Targets & Putting Renewables to Work*, Overview Report, Monitoring & Modelling Initiative on the Targets for Renewable Energy (MITRE), at www.ewea.org/fileadmin/ewea_documents/documents/policy/external_documents/040330_MITRE_overview_-_Meeting_the_targets_and_putting_renewables_to_work.pdf; MITRE, <http://mitre.energyprojects.net>.

³⁹ European Commission, EU Citizens' summary.

⁴⁰ Fraunhofer ISI, Ecofys, EEG, Rütter + partner, LEI, SEURECO, *EmployRES*, *supra*.

Despite these optimistic forecasts, there is still a good deal of scepticism about the impact of the green economy on employment. A research group set up at the Rey Juan Carlos University in Madrid and supported by the Bruno Leoni Institute⁴² recently published some statistics questioning the overall impact of the green economy on employment growth⁴³. The study found that certain 'green' programmes actually destroy more jobs than they create. In Spain, renewable energy resulted in the loss of 2.2 jobs for every green job created in the traditional sectors, without taking into account the jobs that might have been created by private investment⁴⁴. In France, the employment forecasts by the government, according to which 600,000 jobs would be created by fifteen environmental protection programmes under the Grenelle de l'Environnement, have attracted considerable criticism⁴⁵, mainly because of shortcomings in data collection methodology. In Italy, the Bruno Leoni Institute has cast doubt on the potential of the green economy to make a significant contribution to employment growth⁴⁶. The Institute takes issue with the optimistic view that the green economy will increase employment rates in Italy, maintaining that investments of this kind are not part of an effective policy for the creation of jobs.

In the same vein, a number of studies conducted in the United States have focused on the risks of overestimating the employment predictions⁴⁷, pointing out the doubts among scholars⁴⁸. Although public support for the green economy is strong, the jobs that are created in this sector are not necessarily of good quality⁴⁹. There has even been talk of a 'green bubble'⁵⁰, and some researchers have argued that environmental protection measures may result in a loss of jobs⁵¹. Even shifting from a quantitative to qualita-

⁴¹ J. Rutovitz & A. Atherton, *Energy Sector Jobs to 2030: A Global Analysis, prepared for Greenpeace International by the Institute of Sustainable Future, University of Technology, Sydney, 2009.*

⁴² See L. Lavecchia & C. Stagnaro, *Are Green Jobs Real Jobs?* (Milan: Istituto Bruno Leoni, May 2010), 8.

⁴³ See G.A. Calzada, R.M. Jara & J.R. Rallo Julián, *Study of the Effects on Employment, supra.* For a comprehensive explanation of the Spanish debate started after the publication of this study, see G. Rossi, 'Job Creation and Job Losses Related to Green Investments: An Overview of the Current Debate', *supra.*

⁴⁴ See G.A. Calzada, R.M. Jara & J.R. Rallo Julián, *Study of the Effects on Employment, supra*, 29.

⁴⁵ The study commissioned by the Minister of the Environment Jean-Louis Borloo and carried out by the Boston Consulting Group BCG has been criticized by M.B. Beaudet, 'Doutes sur la création des 600 000 emplois verts', *Le Monde*, 30 July 2009. However, the focus on the employment impact of environmental policies is not present in the most recent French government strategy for sustainable growth; see Premier Ministre, 'Stratégie nationale de développement durable 2010-2013. Vers une économie verte et équitable, 2009', *ADAPT Bulletin*, September 2010.

⁴⁶ L. Lavecchia & C. Stagnaro, *Are Green Jobs Real Jobs?*, *supra.* 40.

⁴⁷ See R.H. Bezdek, *American Solar Energy Society, Estimating the Jobs Impacts of Tackling Climate Change*, *www.adapt.it, Green Jobs*, 21 October 2009.

⁴⁸ R. Michaels & R. Murphy, *Green Jobs Fact or Fiction? An Assessment of the Literature, Institute for Energy Research*, January 2009, *www.adapt.it, Green Jobs.*

⁴⁹ A. Morriss et al., *Green Jobs Myths*, University of Illinois, Law & Economics Research Paper No. LE09-001, and Case Western Reserve University, Research Paper Series No. 09-15, 12 March 2009, *www.instituteforenergyresearch.org/issues/green-jobs-resources/.*

⁵⁰ R. Bell, *Speech at the Brooklyn College*, City University of New York, *http://robertibell.com/thegreenbubble.html*, 2009.

⁵¹ See M. Babiker & R.S. Eckaus, *Unemployment Effects of Climate Policy*, MIT Joint Program on the Sciences and Policy of Global Change, Report No. 137, MIT, Cambridge, 2006. The authors argue that emission restrictions would have a negative effect on employment and on growth rates in the United States.

tive approach, the doubts remain. The influential study by ILO and the UNEP⁵² looked at four possible

outcomes. In some cases, new jobs will be created, in occupations dealing with technological instruments related to pollution control or updating existing tools and machinery. In other cases, the workforce will be replaced, as a result of the shift from fossil fuels to renewable power or in order to comply with waste management guidelines. In certain other cases, some jobs will no longer be regarded as necessary. This is particularly true for those occupations relating to materials and procedures that are no longer allowed under the most recent regulations. Finally, the provision of further training for existing occupations also needs to be considered, as well as the emergence of new occupations to meet the market demand and to comply with new environmental protection rules.

As for the classification of workers, in the United States, green jobs may be seen in terms of 'green collar jobs', which are reasonably well-qualified occupations providing opportunities in terms of career advancement and wages⁵³. However, trends in the European labour market over the last decade suggest that the green sector includes both low-paid unskilled jobs and highly skilled occupations⁵⁴.

At a European level, policies could be adopted to create new forms of green employment, to cope with the increasing polarization of the labour market, and to mitigate the impact of such measures on women in the workforce. According to the literature⁵⁵, green jobs are increasing in male-dominated industries and occupations.

Another aspect to consider is the skills mismatch, that is, the lack of qualifications that means that workers are unable to keep up with changes and innovation in the economy. Several studies highlight a lack of 'green' competencies, see section 4 below⁵⁶. In the green economy, there is a need for new vocational skills and occupations⁵⁷. With many European countries adopting measures to tackle climate change, unskilled and unqualified workers may not see any benefit in terms of employment.

3. Implications for women workers

While the impact of green jobs on employment is uncertain, the need to evaluate the risks and the difficulties for women in gaining access to the green economy is widely acknowledged. This is because most green sectors, such as renewables, transport,

⁵² See UNEP, ILO, 2008, *supra*, 43-44.

⁵³ UNEP, ILO, 2008, *supra*, 288. See literature review in n. 1.

⁵⁴ OECD, *Environment and Employment*, *supra*, 20-21; see also the European Commission in ECORYS, *Environment and labour force skills. Overview of the links between the skills profile of the labour force and environmental factors* (2008), 27.

⁵⁵ See literature review in n. 1.

⁵⁶ See ECORYS, *Environment and labour force skills. Overview of the links between the skills profile of the labour force and environmental factors*, 2008; for an overview of the relation between skills, productivity, employment growth, and development, ILO, *Report v. Skills for Improved Productivity, Employment Growth and Development*, International Labour Conference, 97th Session, 2008.

⁵⁷ See L. Rustico, *Le competenze: focus sui fabbisogni formativi dei lavoratori impiegati nei settori eco-sostenibili. Presentazione delle strategie per l'analisi delle competenze nei settori verdi*, www.adapt.it, *Green Jobs*.

building, and agriculture, are traditionally male-dominated⁵⁸. The different needs of male and female workers in the green economy have been given scant consideration⁵⁹. At an international level, there is a lack of reliable data about the gender impact of the green economy⁶⁰, except for a survey in Spain⁶¹ that pointed out the risks of the exclusion of women in the transition to the green economy, in spite of what appears to be a greater awareness of green issues⁶² compared to men. Most new green jobs will be created in the industrial sector⁶³, where women are underrepresented. In the energy industry, for which encouraging employment statistics were recorded in 2007, 20% of the workforce were women: 6% of them were employed in technical occupations; 4%, in decision-making positions; and less than 1%, in management⁶⁴. More generally, recent statistics show that women still tend to be employed in (or relegated to) clerical work⁶⁵.

⁵⁸ See the WiRES project, *Women in Renewable Energy Sector*, co-financed by the European Commission, DG Employment, Social Affairs and Equal Opportunities budget heading 04.03.03.01, Industrial Relations and Social Dialogue, promoted by ADAPT together with UPEE, Union for Private Economic Enterprise Bulgaria and the Faculty of Law of the University of Szeged Hungary. The project analyses and promotes social dialogue to raise the employment rates of women employed in renewable energy in Europe and to improve the working conditions in a perspective of gender mainstreaming. See A. Rab, L. Rustico, & S. Terzimehic (eds.), *Women in the Green Economy. A Human Capital Perspective*, ADAPT Dossier no. 12, 7 July 2010; G. Rossi & S. Terzimehic (eds.), *Social Dialogue, Renewable Energy, Female Employment*, ADAPT Dossier, no. 4, 4 June 2010; R. Gospodinova, J. Hajdú & L. Rustico (eds.), *Green Jobs: nuove opportunità o nuovi rischi?*, ADAPT Dossier no. 4, 25 February 2010; G. Rossi (ed.), *The Economic and Occupational Impact of Green Economy*, ADAPT Dossier no. 2, 1 February 2010; F. Mattioli (ed.), *Green Economy and Female Employment: More and Better Jobs?*, Special Adapt Bulletin, no. 3, 15 January 2010.

⁵⁹ In the EU-27 from 2000 to 2008, the female employment rate increased by 5.2%, reaching 59.1% in 2008.

⁶⁰ In the United States, good practices have been developed for the promotion of the female employment in green jobs; see Wider Opportunities for Women (WOW), *Women and the Green Economy. An Opportunity for Economic Security* (Washington: WOW, March 2009). In Europe, some research has dealt with the relation between women and environmental issues, mainly referring to access to resources by women; with reference to energy resources, see J. Clancy, S. Oparaocha, & U. Roehr, *Gender Equity and Renewable Energies*, paper discussed during the International Conference for Renewable Energies, 2004. Other studies have proposed a gender analysis of the mitigation and adaptation policies to climate change. See G. Terry, *No Climate Justice without Gender Justice: An Overview of the Issues*, *Gender and Development* 17, no. 1 (2009): 5-18.

⁶¹ International Labour Foundation for Sustainable Development (Sustainlabour), *Green Jobs and Women Workers. Employment, Equity, Equality* (Sustainlabour, 2009).

⁶² OECD, *Gender and Sustainable Development: Maximising the Economic, Social, Environmental Role of Women* (Paris: OECD, 2008).

⁶³ Sustainlabour, *Green Jobs and Women Workers*, *supra*, 8. In particular, one-third of the total employment will be created in the building trade sector through reconstruction and building activities in accordance with environmental standards and will contribute to the fulfilment of the energy efficiency targets. In the same way, transport system will contribute to green employment growth, in particular through the planning and the production of low-emission vehicles, infrastructure, and public transport. Finally, new occupations will be created in the manufacturing sector in relation to low environmental impact technologies, materials, instrumentation, and techniques. These sectors employed less than 25% women workers in 2009, with peaks of 38% in agriculture and 30% in manufacturing, on the basis of EUROSTAT data. For an overview of the European labour market, see G. Rossi, 'The State of the Art in the European Labour Markets', in G. Rossi & S. Terzimehic (eds.), *Social Dialogue, Renewable Energy, Female Employment*, *supra*.

⁶⁴ Sustainlabour, *Green Jobs and Women Workers*, *supra*, 9.

⁶⁵ For a recent classification and analysis of the women's segregation in the labour market, useful to understand the trends also in green jobs, see European Commission Expert Group on Gender and Employ-

Women risk finding themselves without the necessary qualifications to take advantage of opportunities in the green economy due to a lack of skills and expertise. A recent empirical study⁶⁶ suggests that the requirements for occupations in renewable energy tend to exclude women. A survey of the gender of graduates in different subjects⁶⁷ found that women were underrepresented in science, technology, engineering, and mathematics⁶⁸. Vocational training programmes are seen as increasingly male-oriented. At the same time, the renewable energy sector requires workers with a certain level of expertise in the electric/energy sector and who are willing to travel, both factors that tend to discourage working women.

The needs of women workers⁶⁹ are not limited to access to the labour market but also concern other factors, such as working conditions, career paths, wage differentials, access to training contracts, and health and well-being at workplace, that may be a male-dominated environment.

All the factors mentioned above may increase the level of female employment in the green economy, as long as effective support is provided. The need to adopt measures aimed at promoting equality between men and women in the labour market is widely acknowledged. This is particularly true in the emerging sectors of the economy, where there is an attempt to move beyond gender equality in theoretical terms.

In Italy, an initiative launched by the Minister for Equal Opportunities together with the Minister of Labour, Health and Social Policy⁷⁰ aims to promote the social inclusion of women and facilitate their access to the labour market by means of green employment. The programme focuses on two main objectives. First, it aims to encourage greater participation by women in non-traditional employment, for example, the energy sector, promoting working conditions allowing for work-life balance, supporting programmes to ensure equal opportunities in terms to vocational training and retraining in line with the needs of the labour market, and providing information about job opportunities in these fields. Second, it aims to strengthen female employment in the sectors traditionally employing a high percentage of women, such as education, health, and social services, by creating high-profile positions to promote energy saving and environmental protection.

ment EGGE, *Gender Segregation in the Labour Market: Root Causes, Implications and Policy Responses in the EU* (2009).

⁶⁶ L. Rustico & S. Terzimehic, 'Women in the Green Economy: A Snapshot', in A. Rab, L. Rustico, & S. Terzimehic (eds.), *Women in the Green Economy. A Human Capital Perspective*, *supra*, 2-9.

⁶⁷ This refers to data from the OECD database in L. Rustico & S. Terzimehic, 'Women in the Green Economy: A Snapshot', *supra*, 4-5.

⁶⁸ This trend excludes the more highly qualified female workforce; UNESCO, Institute for Statistics, *Global Education Digest: Comparing Education Statistics across the World*, 2009. The green jobs challenge might result in the promotion of equal opportunities in high-profile positions.

⁶⁹ Recent European studies continue to highlight the challenges and the problems connected to the quality of the women's work. See European Commission, *Report on Equality between Women and Men* (2010); Eurofound, *Patterns of Recent Employment Growth in the EU: Implications for Gender Equality* (2009).

⁷⁰ Ministry of Labour, Health and Social Policy, Ministry for Equal Opportunities, *Italia 2020: Programma di azioni per l'inclusione delle donne nel mercato del lavoro*, www.lavoro.gov.it, 1 December 2009, in *ADAPT Bulletin* no. 37, 7 December 2009. See also M. Bettoni & C. Bizzarro (eds.), *Parità di genere: i progressi e le sfide*, *Special Adapt Bulletin* no. 8, 8 March 2010.

In order to cope with the challenges posed by the labour market, gender issues should be dealt with by means of gender mainstreaming, which appears to be the only approach reflecting the complexity of the problems associated with gender equality.

4. Skills for the green economy: towards a new concept of education and training

One of the major challenges in the green economy is to provide a practical evaluation of quantitative and qualitative factors associated with green jobs, particularly the skills needed in the labour market to achieve a better match between supply and demand. The need to develop skills for employment in the green economy is widely acknowledged at an international level, as shown by the reports issued by the European Commission⁷¹, the UNEP⁷², OECD⁷³. The literature on the issue is extensive⁷⁴. The demand for specific green skills has also been analysed in a more general view, in terms of the ability to deal with restructuring and ongoing changes⁷⁵.

An aspect that is not given much consideration in Europe is the harmonization between the education and training system and the green labour market, although an increasing number of authors are focusing on the strategic role of social dialogue and industrial relations in providing innovative placement services⁷⁶.

Climate change is expected to have two main consequences in terms of skills development. Policymakers will come under pressure to develop new policies and to assess the skills needs of the labour market, as well as the effects of environmental policies on employment⁷⁷. The definition of green skills has been the subject of heated debate at an international level, with scholars holding divergent positions, giving rise to considerable uncertainty.

If the focus is on the content of the work performed, a widely used definition is the one adopted by the OECD, according to which skills and qualifications for green jobs are

⁷¹ European Commission, *New Skills for New Jobs – Anticipating and Matching Labour Market and Skills Needs*, COM (2008) 868, www.adapt.it, *Green Jobs*, 16 December. Also EMCO Working Group, *The Employment Dimension of Tackling Climate Change*, Progress Report, Draft, 24 June 2010.

⁷² UNEP, ILO, *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World*, *supra*.

⁷³ OECD, *Environment and Employment*, *supra*; OECD, *Seminar Social and Environment Interface Proceedings* (Paris: OECD, 1999), www.adapt.it, *Green Jobs*.

⁷⁴ TNO Netherlands Organization for Applied Scientific Research, SEOR Erasmus University Rotterdam, ZSI Centre for Social Innovation, *Investing in the Future of Jobs and Skills Scenarios, Implications and Options in Anticipation of Future Skills and Knowledge Needs. Sector Report: Electricity, Gas, Water and Waste*, www.adapt.it, *Green Jobs*, May 2009.

⁷⁵ I. Turok & P. Taylor, 'A Skills Framework for Regeneration and Planning', *Planning Practice and Research* 21, no. 4 (2006): 497-509.

⁷⁶ P. Szovics, M. Tessaring, & A. Zukersteinova – Cedefop, 'Skills for Green Jobs: The Pathway is Green', in R. Gospodinova, J. Hajdú & L. Rustico (eds.), *Green Jobs: nuove opportunità o nuovi rischi?*, *supra*. American experiences in the construction of network and shared paths for the workers' green jobs training in the green economy. See S. White & J. Walsh, *Greener Pathways. Jobs and Workforce Development in the Clean Energy Economy* (Madison: Center on Wisconsin Strategy, University of Wisconsin, 2008), www.adapt.it, *Green Jobs*.

⁷⁷ J. Scott, *Future Skills Needs for the Green Economy: Some Starting Points*, Third Generation Environmentalism, 3G, London, www.adapt.it, *Green Jobs*, 5 October 2008. For a bibliography review on the impact of climate change on skills policies, GHK, *The Impacts of Climate Change on European Employment and Skills in the Short to Medium-Term: A Review of the Literature*, Final Report – Volume 2, www.adapt.it, *Green Jobs*, 2009.

similar to those required in more traditional occupations⁷⁸. This view is confirmed if we consider the US labour market, taken as a reference model in this connection. In this case, occupational requirements comprise basic skills that do not differ from traditional ones, in terms of education and working experience⁷⁹. In the same vein, studies in Australia suggest that green skills should be acquired at the same time as or soon after the main skills needed for a given occupation⁸⁰.

Green skills may be regarded as generic, as argued by the OECD, since they are difficult to define and acquire, but at the same time, they are essential⁸¹, considering in particular the concept of sustainability, its implementation in management and production, an awareness of innovative technology and standards and green manufacturing processes, as well as sustainable procurement, which has been promoted by the European Commission by means of a specific programme⁸².

Soft skills refer to a range of skills, such as the ability to ensure compliance with safety standards during production; a willingness to change jobs; teamworking skills; the ability to strengthen motivation in the workplace, to raise awareness of environmental issues, to carry out a product life-cycle analysis, and to adopt environmentally friendly technology; as well as the ability to communicate and to sell goods and services within the eco-business. More generally, those taking up new occupations in green employment require various kinds of knowledge, which should include an awareness of the legal provisions and instruments dealing with environmental issues, and the ability to determine resource availability on the basis of the sector and the geographic area. Furthermore, depending on the economic background, further skills should be gained aimed at ensuring and managing sustainable development and becoming aware of the processes associated with sustainability, in economic, environmental, political terms⁸³. In recent publications, however, the OECD seems to move away from its initial position, maintaining that the green economy calls for traditional and new skills⁸⁴, including an understanding of sustainable materials, an ability to carry out environmental impact assessments, and an understanding of carbon footprinting, as stated by the European Commission.

⁷⁸ OECD, Seminar Social and Environment Interface Proceedings, *supra* See also Institut für Wirtschaft und Umwelt & A.K. Wien, *Environment and Employment: Sustainability Strategies and Their Impact on Employment*, www.adapt.it, Green Jobs, 2000.

⁷⁹ J. Clearly & A. Kopicki, *Preparing the Workforce for a 'Green Jobs' Economy*, John J. Eldrich Center for Workforce Development, Rutgers, 2, www.adapt.it, Green Jobs, February 2009. For case studies, see Environmental Defense Fund, Ella Baker Center for Human Rights, Apollo Alliance, Oakland Partnership, *Green Jobs Guidebook. Employment Opportunities in the New Clean Economy*, 2009.

⁸⁰ This approach, by significantly reducing the costs in terms of economic and time resources for green skills training, could also make the business world, for which environmental protection is mainly a cost, aware of the need to upgrade the skills of the workforce in view of environmental challenges. D. Goldeney et al., *Finding the Common Ground: Is There a Place for Sustainability Education in VET?* (NCVER, 2007), 2.

⁸¹ C. Down, *Employability Skills: Revisiting the Key Competencies or a New Way Forward?* (Brisbane: Australian Academic Press, 2004).

⁸² European Commission at http://ec.europa.eu/environment/gpp/index_en.htm.

⁸³ M. Rigg, *Skills for Sustainable Development: Necessary but Not Sufficient?*, Policy Study Institute, October 2008, 12.

⁸⁴ C. Martinez Fernandez, C. Hinojosa, & G. Miranda, OECD, *Greening Jobs and Skills, The Local Labour Market Implications of Addressing Climate Change* (Paris: OECD, February 2010).

According to a survey carried out by Cedefop⁸⁵, skills in the green economy will be characterized by their interdisciplinary nature, moving beyond a particular position or sector. Communication and problem solving in relation to environmental issues, as well as the use of appropriate technology, are key instruments for employees in the green economy⁸⁶.

Communication skills play a significant role in the green economy, as there will be a growing need for professionals who are able to explain to managers, enterprises, and consumers how to implement and benefit from new technologies, on the basis of a process known as cascade communication. Researchers from Cedefop and ILO⁸⁷ argue that green skills have given rise to a new concept that moves beyond the traditional distinction between 'basic' and 'transversal' competences. The new approach highlights the need for a wealth of knowledge that combines traditional and new skills, consisting of 'shades of green'⁸⁸. While some experts point out the innovative nature of green skills, such as the assessment of environmental impact and knowledge of environmental protection laws⁸⁹, the majority maintain that these are existing skills that have been adapted to sustainability and new trends in the labour market, to construct a new society based on information and knowledge. In this connection, a UNEP report⁹⁰ states that a wider range of skills will be required in the green economy, with an educational background and training also in green-related activities, not only in eco-industries, strictly speaking.

The level of employment is another matter to consider in defining green skills, with the OECD⁹¹ and the European Commission⁹² arguing that employment is becoming more and more polarized. The ILO, in its research on decent work, points out that the risks arising from low-qualified occupations in the green economy are closely related to inadequate education and training⁹³.

⁸⁵ Cedefop, *Skills for Green Jobs. European Synthesis Report* (Luxembourg: Publications Office of the European Union, 2010), www.ilo.org/wcmsp5/groups/public/-ed_emp/-ifp_skills/documents/publication/wcms_143855.pdf.

⁸⁶ P. Szovics et al., *Identification of Future Skill Needs for the Green Economy* (Cedefop, 2009).

⁸⁷ Cedefop, *Skills for Green Jobs*, *supra*. The International Labour Organization, together with Cedefop, is carrying out research on skills needs in the green economy. The research, to be published in 2010, is based on fifteen countries, outlines good practices, and highlights the fact that national policies for green energy are inevitably integrated with the identification of vocational needs and effective responses to these requirements.

⁸⁸ The expression is mainly used with reference to the different extent to which product sectors, in different regions, are affected by the economic and political change arising from the green economy; this term was adopted in UNEP, ILO, 2008, *supra*, 40. Further considerations about the political implications of stimulus packages can be found in M. Nikolova, *Light Shades of Green. Climate-Friendly Policies in Times of Crisis* (ETUI, 2009).

⁸⁹ Cedefop, *Future Skill Needs for the Green Economy*, Seminar 6-7 October 2008. Papers available at www.cedefop.europa.eu/etv/news/default.asp?idnews%43800.

⁹⁰ UNEP, ILO, 2008, *supra*, 4.

⁹¹ OECD, *Environment and Employment*, *supra*.

⁹² European Commission, *Commission Staff Working Document on the Links between Employment Policies and Environment Policies*, 2005.

⁹³ C. Evans-Klock & P. Poschen, *ILO Green Jobs Initiative and Implications for Skills Development. On decent work and climate change*, cf., International Labour Office, *The Social and Decent Work Dimensions of a New Agreement on Climate Change* (Geneva: ILO, June 2009).

The US case shows that workers in the green economy may be classified as having low to mid-range qualifications⁹⁴, generally provided by community colleges, offering higher vocational education, usually over a period of two years.

A United Nations survey suggests that all occupations may be regarded as green and that skills associated with such positions will affect unskilled workers, professionals, business people, engineers, craftsmen, managerial staff, and so on⁹⁵. There may also be a positive impact on female employment, considering that skills development and adaptation will be required in all economic sectors.

Research carried out by Cedefop⁹⁶ points out that all working activities should somehow be characterized by a 'green factor', with a need for training programmes and courses for those who are willing to acquire new skills. In this connection, there is a need to distinguish between human resource management taking into account sustainable development⁹⁷ and the need to (re)train adult workers on the basis of labour market needs.

Training needs have been investigated in a number of studies, including those on Education for Sustainable Development and the 1987 Bruntland Report, which examined evidence from national cases in Europe⁹⁸. A new field of research, the greening economy, is now developing, focusing on academic programmes, teaching methods, and bio-construction, on the assumption that environmentally related education and training programmes might result in a new learning approach leading to a more sustainable society, supporting the individual in the transition from school to university and in life-long learning.

Moreover, several international forums⁹⁹ and some studies in Australia¹⁰⁰ have predicted that, especially in the short run, vocational training in the green economy will have a decisive impact on educational policies¹⁰¹. This will concern not only entry-level workers but also experienced workers in need of retraining due to company restructuring, and therefore, at risk of being forced out of the labour market. In Europe, training and retraining programmes may also be a means to increase the levels of flexibility, save jobs, and tackle gender inequalities, as in the case of the electrical power industry¹⁰².

⁹⁴ Workforce Alliance, *Oregon's Forgotten Middle-Skill Jobs, Meeting the Demands of a 21st Century Economy* (February 2009).

⁹⁵ C. Degryse & P. Pochet, *Paradigm Shift: Social Justice as a Prerequisite for Sustainable Development* (ETUI, February 2009).

⁹⁶ Cedefop, *Skills for Green Jobs-European Synthesis Report*, 2010.

⁹⁷ D. Renwick et al., *Green HRM: A Review, Process Model, and Research Agenda*, University of Sheffield Management School, Discussion Paper No. 2008, 1 April 2008; J. Haddock et al., *Green HRD: The Potential Contribution of HRD Concepts and Theories to Environmental Management*, Education against Climate Change Programme, Middlesex University, 2009.

⁹⁸ Danish Ministry of Education, Department of Higher Education and International Cooperation, *Education for Sustainable Development. A Strategy for the United Nations Decade 2005-2014* (February 2009).

⁹⁹ See *World Summit on Sustainable Development*, 2002.

¹⁰⁰ D. Goldney et al., *Finding the Common Ground etc.*, *supra*.

¹⁰¹ The potential widening of the focus of vocational training deserves further consideration. See Goldney et al., *Finding the Common Ground etc.*, *supra*, 19 et seq.

¹⁰² D. Tarren, H. Potter, & S. Moore, *Restructuring in the Electricity Industry: A Toolkit for Socially Responsible Restructuring with a Best Practice Guide*, A Report for EURELECTRIC, EPSU, and EMCEF, Working Lives Research Institute, March 2009.

With regard to sustainable development, further research may be carried out on the impact of occupational skills on productivity, competitiveness, organizational models, and health and safety in the workplace¹⁰³.

It has been suggested¹⁰⁴ that this impact is dependent on the way skills are developed, on the effectiveness of education and vocational training programmes, and on the provision of alternative solutions in terms of skills development, by including networks and partnerships. This approach appears to be useful in promoting social dialogue and innovation in industrial relations, providing a contribution to the setting up of research centres in the field of greening education and training in the workplace¹⁰⁵ based on the principle of subsidiarity.

On the basis of these considerations, the question arises as to whether the traditional education and training system will prove effective in responding to the challenges posed by the changing labour market in the green economy. An increasing awareness of the inadequacy of formal learning for occupations regarded as 'green' points to the need for innovation in learning strategies, focusing on the acquisition of soft skills, which include more general knowledge, that is decisive in green employment. The acquisition of these skills should take place in the workplace, regarded as the most suitable environment for the acquisition of further abilities¹⁰⁶, allowing for economically sustainable on-the-job experience.

The implementation of alternative education strategies should be associated with a different perception of learning methods, in order to respond to market demand while promoting a sound pedagogical approach to environmental issues¹⁰⁷.

Following the example of United States and Australia, a solution might be found in the setting up of networks and partnerships among educational bodies, training providers, universities, enterprises, and the actors involved in social dialogue and industrial relations, to develop sector-specific skills and to share new ideas on training programmes responding to market needs¹⁰⁸. Green employment can make a major contribution in terms of environmental protection, as in every occupation there is a 'green factor'. In addition, awareness of green issues begins in primary school, as shown by the research focusing on greening education, and continues throughout life. Green skills are the result of a lifelong learning process, with the concept of workplace learning or work-based learning becoming increasingly relevant. In addition, work-based learning serves as a response to changes in the green sector in terms of job opportunities, the develop-

¹⁰³ A possible skills classification for green jobs, with reference to their potential for reducing carbon emissions, distinguishes between leadership, innovation, process, and technical application skills.

¹⁰⁴ New South Wales Department of Education and Training, *Skills for sustainability*, 2007.

¹⁰⁵ See C. Lloyd & Payne J., 'Developing a Political Economy of Skill', *Journal of Education and Work* 15, no. 4 (2002): 365-90. See also N. Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007).

¹⁰⁶ C. Virgona & P. Waterhouse, *Two Dimensional Work: Workplace Literacy in the Aged Care & Call Centre Industries* (2004). In Italy, in the White Paper of 2009, at www.adapt.it, *Welfare*, the Ministry of Labour considered the enterprise as the most appropriate place for learning and skills development.

¹⁰⁷ In the Italian case, the traditional approach to vocational training, connected with state-sector education, should be replaced by the modern concept of learning based on skills and learning outcomes, closer to production processes and to technological innovation.

¹⁰⁸ P. Newman et al., *Training for Sustainability: The Vocational Education and Training Sector*, Green Skills Inc., Centre for Learning, Change and Development and Institute for Sustainability and Technology Policy (Murdoch University, 2004).

ment of which are difficult to forecast¹⁰⁹, especially in a financial downturn, when it becomes harder to plan production in the medium and long term.

5. The role of industrial relations and social dialogue

In the coming years, the demand for vocational training and retraining in the green economy will increase significantly, together with the need to provide effective guidance on the skills needed in the labour market¹¹⁰. It will be necessary to increase and adapt the workforce, providing workers with higher levels of qualifications, also in an attempt to reduce gender inequalities. To be effective, this strategy should not involve state intervention, often ambitious and unrealistic, aimed at overseeing and managing the reorganization and restructuring process.

Rather, based on the principle of subsidiarity, it should entail the participation of all those actors, including the social partners, who can help to address the mismatch between supply and demand in the green economy¹¹¹. The industrial relations system can play a leading role in an economy with a lower environmental impact, supporting the reorganization and the restructuring of production. Particular attention should be paid to the most vulnerable workers, who are more exposed in the event of restructuring and the transition to a more sustainable economy.

Collective bargaining could develop further techniques providing incentives to support the transition towards the green economy, vocational training and retraining (also for women workers), and inclusion in the green sector¹¹². Although regarded as a priority in the green agenda of many countries¹¹³, measures encouraging good practices are still rare (see Table 1), especially with regard to the employment and gender impact of environmental policies¹¹⁴. Although it is clearly difficult to identify a common instrument to manage the economic crisis, the social partners have agreed on some priorities, even in times of recession¹¹⁵. Apart from the recognition of workers' rights to information, consultation, and participation in the green economy and at company level, there is also a need to provide employees with adequate training to face employment transition and

¹⁰⁹ C. Degryse, *What's in the Sustainable Development Strategy for Workers?*, ETUI Benchmarking Working Europe 2009 (Brussels: ETUI, 2009).

¹¹⁰ See Cedefop, *European Guidelines for Validating non-formal and Informal Learning*, 1 June 2009; M. Campbell et al., for the European Commission, *New Skills for New Jobs*, February 2010. See the Italian agreement on the *Linee guida per la formazione nel 2010* signed by the Government and Region representatives and social partners on 17 February 2010 in E. Bellezza & L. Rustico (eds.), *2010: l'anno della formazione*, ADAPT Bulletin no. 6, 18 February 2010. See also E. Bellezza & L. Rustico (eds.), 'Formazione e dialogo sociale: l'intesa Governo, Regioni e parti sociali del 17 febbraio 2010', *Diritto delle Relazioni Industriali* 2 (2010).

¹¹¹ See ETUC, *Climate Change and Employment*, *supra*.

¹¹² J. Scott, *Future Skills Needs for the Green Economy etc.*, *supra*.

¹¹³ Eurofound, *Greening the European Economy: Responses and Initiatives by Member States and Social Partners*, www.adapt.it, *Green Jobs*, 2009. See ETUC, *Climate Change and Employment*; ETUC, *Mid-term Review of the 6th Community Environment Act Programme*, Position of the European Trade Union Confederation ETUC, www.etuc.org/IMG/pdf/6th_EAP_mid-term_Review11.pdf, 2006.

¹¹⁴ A review of <http://ec.europa.eu/social/main.jsp?catId%4521&langId%45en> shows the lack of joint texts, documents, and agreements on the topic.

¹¹⁵ J. Hurley et al., (Eurofound), 'Restructuring in Recession, European Restructuring Monitor (ERM), 2009', in P. de Vita & M. Giovannone (eds.), *Elder Employees During Restructuring: Stress and Well-Being*, Special ADAPT Bulletin no. 7, 2 March 2010.

changes in the labour market. Effective skills retraining should help respond to economic fluctuations during recession¹¹⁶.

Social dialogue in Europe can provide a major contribution to the implementation of the green agenda, also in terms of training and retraining programmes¹¹⁷, as shown by the initiatives of employers' associations and trade unions in Table 1.

More generally, social dialogue and industrial relations have to focus on rethinking education and training in the light of future occupational requirements. Educational institutions, with the social partners, should promote a multidisciplinary learning environment within the company, including internships to help young people gain access to the labour market. Trade unions and employers' associations could provide written certification of the skills acquired in non-formal and informal contexts, with the support of educational experts. Training should be provided also for teachers, with a special focus on the specific needs of women teachers.

The European Commission and Cedefop have highlighted the need to establish a stronger link between the needs of the enterprise and the education and training system, in order to raise awareness of environmental issues, which is essential for sustainability in the green economy. Accordingly, the industrial relations actors should develop the potential of the green economy in full, transforming risks into opportunities for all those involved.

Table 1. Initiatives by the Social Partners at European Level in the Field of Vocational Training and Retraining in the Green Economy

Country	Practices
Ireland	The employers' confederation IBEC provides environmental training for members; this includes a Foundation Course in Environmental Management for managers wishing to get up to speed on current environmental performance trends, standards legislation, and solutions.
Norway	The Norwegian Association of Local and Regional Authorities along with the Confederation of Unions for Professionals and the Norwegian Union of Municipal and General Employees have organized a conference for safety representatives and trade union representatives, in order to develop their knowledge and expertise in relation to green issues. The trade union confederation LO and its member unions have set up courses on climate change for shop stewards.
Belgium	Regional plans: research and training in green technologies. National social dialogue structures – namely, the National Labour Council and the Central Economic Council – are currently active in relation to environmental issues and are preparing a joint statement on green jobs. An innovative scheme exists in Belgium, whereby long-term jobseekers are trained to carry out energy assessments and help advice on energy-saving measures. These people are called 'energy trimmers' and help to implement energy-saving measures in buildings through 'energy trimming companies', which are not-for-profit organizations. The schemes exist in all regions of the country.
Spain	Social dialogue on green issues is carried out within the framework of the country's

¹¹⁶ On the importance of investing in education and training in times of crisis, see Cedefop, *Learning in Crisis Times*, November 2009, www.adapt.it, *Green Jobs*, November 2009. See also Council Decision on *Guidelines for the Employment Policies of the Member States*, 7 July 2008 10614/2/08 REV 2.

¹¹⁷ Eurofound, *Greening the European Economy*, *supra*.

	standard tripartite social dialogue structures and is linked to the debate on the modernization of the economy.
Italy	The government has set up a fund to finance research projects on energy efficiency and the use of renewable energy sources in urban areas. The trade fair SolarExpo and the employment agency Adecco have developed training and retraining courses for technicians in the solar panel and wind farm industry. Under this scheme, skills that are particularly relevant to these industries are taught. The Association of Energy Producers from Renewable Sources organizes company training and information courses on European and national regulations in the energy and environment sector.
Finland	The National Commission on Sustainable Development acts as an important tripartite forum where different stakeholders can present their ideas, goals, and programmes, as well as engage in a broad debate about ecological sustainability. The employer organization EK has published a guide on corporate responsibility, which contains tools for self-evaluation and development for companies. The construction industry branch and the biotechnology industry association Finnish Bioindustries have also published their own principles on corporate social responsibility, business ethics, and sustainable development.
Hungary	Regional operational programmes, provisions for the setting up of regional crisis management funds to help in cases of company restructuring and to support vulnerable enterprises by providing exemptions from payroll taxes to enable companies to maintain their workforce.
Denmark	Environmental Economic Council – economic advisory body, established by law in 2007. Twenty-four members representing trade unions, employers, non-governmental organizations (NGOs), independent experts, and the Danish government.
Slovenia	Seminars have been held for business representatives to help them prepare for legislative changes related to the green economy.
Austria	National and local governments have launched a joint initiative, known as Masterplan Environmental Technology, aiming to set up a joint strategy for policy-makers, business, and relevant research institutions to improve the competitiveness of the Austrian environmental technology industry. The government is looking at reforming the country's vocational training scheme in order to meet increasing business demand for skilled workers in the environmental technology sector. On the employer side, courses are run by the Austrian Federal Economic Chamber to help members reduce energy consumption.
Luxembourg	A conference to debate climate protection and economic and employment prospects was organized by government ministries and the Chamber of Employees in February 2009.
Estonia	Much effort has been invested in raising public and consumer awareness of green issues through a variety of means – including the development of a network of local environmental education centres, the provision of training days and seminars, and the holding of national and international conferences.
Poland	The celebration of Earth Day 22 April 2009 included information campaigns, educational initiatives, and workshops. Government training courses are offered in order to train technicians in environmental management, as well as in health, safety, and environment at the workplace.
Portugal	The General Workers' Union is preparing to introduce environmental issues into its training activities for collective agreement negotiators.
The UK	The employer organization, the Confederation of British Industry (CBI), highlights that skills are needed in areas such as science, technology, engineering and maths,

	<p>technical competencies, and a range of new business skills. The CBI makes a range of recommendations on how to increase the number of workers with these skills: these include encouraging a greater focus on such skills in schools and proposing ways to encourage education providers to work with business to meet the demand for these types of skills. The CBI has been running regular events on issues related to climate change for its members. For example, in 2009, it is running a series of three breakfast seminars on the subject of environmental legislation for people involved in property management and leasing. The TUC operates a range of courses for trade union representatives, helping them to address the following issues: identify environmental changes that affect the workplace; research and identify appropriate environmental legislation, policies, and information; and identify environmental problems and opportunities for trade union action.</p>
Germany	<p>The Confederation of German Trade Unions and affiliates participate in two working groups – one on energy and the other on the environment – within the country's tripartite 'Alliance for jobs, training and competitiveness' initiative. A joint body has been established to provide information and training to work councils on environmental protection issues. The trade union confederation DGB, in cooperation with the educational institution DGB Bildungswerk and the German Ministry for the Environment, Nature Conservation, and Nuclear Safety, runs a project in German entitled 'Resource Efficiency in Firms'. The project trains work council members and employees in detecting and implementing ways to improve energy efficiency. The training is part of a programme that leads to a certified degree as an 'efficiency expert'. The metalworking trade union IG Metall cooperates with the employer association of the aluminium industry in implementing this project at workplace level.</p>

Source: Eurofound, Greening the European Economy: Responses and Initiatives by Member States and Social Partners, 2009