

### Green jobs Observatory

In collaboration with the Marco Biagi Centre for International and Comparative Studies

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# The economic and occupational impact of green economy

edited by Giulia Rossi

The fight against climate change is considered one of the major challenges of the twenty-first century, and it can not be longer addressed only from a standpoint of environmental policy. Since the Industrial Revolution in fact, emissions of greenhouse gases (GHGs) have increased more than proportionally to the disposal capacity of the planet, especially during the rapid energy-intensive growth of the last sixty years. Interactions between economic growth and environment are certainly a very complex point. Under the most pessimistic perspective, the global economy will collapse because of environmental problems. At the same time, however, through economic growth and technological development it has been possible to finance investments in new environmentally friendly technologies, particularly those related to energy efficiency. According to the last report of the Intergovernmental

Panel on Climate Change (IPCC) of 2007, risks related to climate change are increasing, and therefore further efforts are needed to ensure a path of sustainable growth in the medium and long term. According to Nicholas Stern, author of one of the most relevant investigations on the economic consequences of climate change (N. Stern, *The Economics of Climate Change: The Stern Review*, Cambridge University Press, Cambridge, 2007), economic policy must recognise that the emissions of GHGs represent a market failure that requires specific corrective measures. From a purely economic point of view, the market fails when its main coordination tools, the prices – for example, the price of aluminium produced with oil or not clean energy – do not correspond to the real costs the society is bearing. Once issued, in fact, GHGs damage the prospects of other individuals and future

WiRES



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**Green Economy and Female Employment. More and Better Jobs?**

edited by Francesca Mattioli

generations which, without any preventive interventions, will pay the highest cost. The Stern Review argues that we need to replace the traditional model of development, highly dependent on carbon compounds, with a new model based on a low use of traditional fuels. Inevitably, it means a change in production systems and, indirectly, on em-

ployment. The aim of this dossier is to provide an overview of the main approaches and positions in the literature on the relationship between green economy and economic growth, with a particular attention to the impact on labour markets.

*Giulia Rossi*

## The economic framework

*by Giulia Rossi*

The aim of this paragraph is to provide a summary of the main contributions in the economic literature, highlighting climate change-related driving forces affecting employment. The paragraph is divided as follows. In the first part, an analyses of the impact of climate change itself on economic activity and employment is provided. The second part focuses on the employment impact of environmental policies and adaptation measures, while in the last part the main contributions concerning the issue of green economy as exit-strategy to the current economic and financial crisis will be reviewed.

### **Climate change and employment**

Very few documents directly analyse climate change and its impact on labour market. Instead, many studies concern its impact on specific sectors' activities, resorting to the results to estimate employment patterns. The assessment of the potential im-

act of climate change itself on employment presents two main challenges. Firstly, because of the presence of other factors affecting employment, it is difficult to isolate the other driving forces in order to highlight the effect of climate change. Secondly, there is a great uncertainty about the future development of world economy and society. This means that a great attention should be put on the forecasting methodologies, minimizing the margin of error. A comprehensive contribution to improve current understanding of the relationship between climate change and employment has been carried out in 2007 by a consortium led by the European Trade Union Confederation (ETUC) and the Social Development Agency (SDA). In this study two kinds of impact are distinguished: the indirect impact of climate change on employment through changes in the value of assets and the direct impact on income and employment through changes in productivity. The study allows for a comprehensive literature review, in addition to the results

of interviews with relevant stakeholders. Using sectoral approaches, the main climate-sensitive economic sectors are identified, namely agriculture, forestry, fisheries, tourism, finance-insurance, health, infrastructure and energy. In the specific case of energy sector, which contributes for about 60% of global GHG emissions according to the International Energy Agency (IEA) data, the strong correlation between energy consumption and climatic conditions (as a consequence of the higher temperature it may be less demand for space heating in winter and more for air conditioning in summer, in addition to altered conditions and potential for electricity production) may imply significant changes in the requested labour force. The main finding is that even moderate climate change will affect economic activity and employment in Europe and the balance of the impacts is expected to be more negative at low than mid- and high-latitudes. Moreover, an increase in global warming levels will be likely to have very dam-

aging consequences (ETUC, SDA, Syndex, Wuppertal Institute, ISTAS, *Climate change and employment. Impact on employment in the European Union-25 of climate change and CO<sub>2</sub> emission reduction measures by 2030*, 2007).

The findings provided by the report carried out by ETUC are also confirmed by other recent analysis. In 2008 a Training Manual for Workers and Trade Unions have been published jointly by Sustainlabour and the United Nations Environmental Programme (UNEP) under the framework of the project *Strengthening trade union participation in international environmental processes*, implemented by UNEP, in collaboration with the International Trade Union Confederation (ITUC), the International Labour Organization (ILO), the World Health Organization (WHO) and the Government of Spain. Starting from an analysis of the potential consequences of climate change – and also of mitigation and adaptation measures – on employment, the report explores the ways trade unions can contribute to climate change from the international to the workplace level. Regarding impacts on employment, two elements are particularly relevant in determining the magnitude of climate change action in a specific geographical area: some physical factors (countries and regions in tropical and sub-tropical areas and those near the poles will be the first to be affected by global warming) and some socio-economic factors (first of all the weight of climate-sensitive activities, in particular agriculture, in the economy). Assuming a great incidence of

heavy precipitations, it is anticipated that employment in the agricultural sector will be adversely affected, especially in seasonal jobs that depend on harvesting and crop-processing. As an example, the destruction of New Orleans in the USA by the Hurricane Katrina in 2005 has resulted in a loss of about 40,000 jobs (Sustainlabour, UNEP, *Climate change, its consequences on employment and trade unions action: Training manual for workers and trade unions*, 2008).

### Climate change policies and employment

First contributions on the specific relationship between environmental policies and employment, date back the 1970s, when such measures started to be introduced. A first review of the literature and the available empirical data has been provided in 1978 by the Organisation for Economic Co-operation Development, OECD (OECD, *Employment and Environment*, Paris, 1978). The issue came back at the surface in two other different periods, both characterized by economic recession and high unemployment rates. Firstly in the 1990s when many OECD countries faced high levels of unemployment. Further the issue is at the core of the political and academic debate since the beginning of the global economic and financial crisis started at the end of 2007. A relevant contribution has been provided in 1997 by the OECD which presented an analytical

framework for discussing the possible employment effects of environmental policies including positive and negative effects, direct and indirect effects, short-term and long-term effects or gross and net effects (OECD, *Environmental Policies and Employment*, Paris, 1997). Drawing on the 1997 publication, a new OECD Programme on Environment and Employment has been launched. This programme expands the previous analysis with a particular emphasis on the economy-wide employment impacts of environmental policies, with a focus on climate change policies (OECD, *Environment and employment. An assessment*, Paris, 2004). According to the OECD report, there is a great variety of studies on employment impacts of environmental policies, ranging from local sectoral policies concerning waste, water and local atmospheric pollution, to global phenomena such as GHGs effects. Some studies only focus on the direct employment effects, e.g. the number of persons employed in some specific activities. Other studies also consider the indirect effects, such as the labour force required to produce the used equipment. Finally, there are some studies which take into account, in addition to direct and indirect employment effects, also the impact on the whole economy. Such macroeconomic feedbacks are included in econometric models, mainly based on a demand-driven view of the economy, where the markets of goods and of labour are in a situation of dis-

**An increase in global warming levels will be likely to have very damaging consequences**

equilibrium, and in general equilibrium models, which are based on equilibrium in all markets. In both types of models, substitution and income effects play a major role, including substitution between energy and other factors of production, between energy-intensive final goods and others, transfers of income, and the labour market's reaction to these changes.

A relevant cross current which has also been developed in the late 1990s, focuses on a new socio-economic paradigm, based on the concept of sustainability, following the UNCED Conference in Rio de Janeiro in 1992. Spangenberg et al. in 1999 examined the environment-employment inter-linkage, providing the definition of a minimum condition of socio-environmental sustainability. The proposed minimum conditions concerns a clear relationship between the labour productivity, the total output and the resource productivity of an economy. As a minimum condition it has been thought to distinguish growth patterns which can not be considered sustainable from those that might be so. This relationship has been the starting point for the development of a new policy scenario based on an highly disaggregated econometric model, called 'Phanta-Rei'. The results provided by several simulations explore the possible trade-offs between social, economic and environmental variables such as economic growth, unemployment rate and material flows due to specific policy instruments, that

**The macroeconomic effects depend on the support schemes and on the adjustment mechanisms in the economy**

are suggested by and tested in the scenario (J.H. Spangenberg, I. Omann, F. Hinterberger, *Sustainability, growth and employment in an alternative European economic policy. Theory, policy and scenarios for employment and the environment*, paper presented at the 5<sup>th</sup> Workshop on alternative economic policy for Europe, Brussels, October 1999). The Phanta Rei model is not the only one used to test sustainable development policies. Another one, called SuE, is less disaggregated system dynamics model for the EU-15. Although the two models are different, also in terms of data set (Phanta Rei has been developed on the German economy's data and SuE on European data-set) the outcomes of different strategies are remarkably close to each other. Both models reveal a trade-off between growth and employment on the one and environmental concerns on the other hand, however sustainable compromises are possible. What is needed is an intelligent mix of economic, social, environmental and labour policy measures. No single policy measure otherwise – neither legal measures nor economic incentives – is able to deliver a sustainable economy (J.H. Spangenberg, I. Omann, A. Bockermann, B. Meyer, *Modelling Sustainability – European and German Approaches*, in M. Matthies, H. Malchow, J. Kriz (Eds), *Integrative Systems Approaches to Natural and Social Sciences – Systems Science*, Springer-Verlag, Berlin, 2000).

Recent contributions on the issue

present some continuities with the previous literature, but also some peculiarities, mainly due to the economic and environmental context. The need of an integrated policy framework which takes into account both the economic and employment recovery, and climate change and energy efficiency issues, has highlighted some specific drivers. Generally, the attention is now related to the specific need to take decisions for the post-Kyoto period and the consequent call for globally redesigning climate policies. Some specific measures have been issued, which imply the attainment of specific objectives. In Europe, a great attention is dedicated to the occupational effects of the Climate and Energy Package, issued by the European Parliament in December 2008 (Position of the European Parliament, EP-PE\_TC1-COD(2008)0016). In particular, the majority of available studies are focusing on the employment effect provided by the achievement of the target of 20% of renewables of final energy production by 2020. The assessment of the job potential of renewables seems to be driven by two main factors. First of all, the renewable energy sector has grown exponentially since the end of the 1990s and optimistic predictions suggest there are still important opportunities to further improve renewable technologies, even if investments have slowed in the last two years, because of the credit freeze. Thus, the relationship between installed MW and number of jobs created is the main indicator of the occupational impact. Moreover, investments in renewable energy sources imply a series of adjustment mechanisms at



the macro-economic level which suggest the combination of different models to reflect the impact on the whole economy. In the specific case of renewables, the macroeconomic effects depend on the support schemes and on the adjustment mechanisms in the economy, which in turn depend on the relative supply and demand elasticity of the different economic agents.

Generally traditional quantitative methods rely on input-output models to estimate job creation or loss. These models measure how changes in demand for specific goods and services affect economic activity and jobs within the specific area of study. Most sophisticated models allow for estimates of net jobs impacts. Measuring long-term economic and employment impact of energy policies is a complex task, sensitive to an array of unknown variables, firstly future prices of both conventional fuel and renewable energy. According to a report commissioned by the European Commission, DG Energy and Transport, the adjustment mechanisms which should be taken into account are: energy price and costs effects, structural demand effects, multiplier and accelerator effects (such as the impact on household and industry behaviour on other economic sectors) and innovation and productivity effects. The final impact on employment of renewable energy investments will depend on the linkages (Fraunhofer ISI, Ecofys, EEG, Rutter + partner, LEI, SEURECO, *EmployRES. The impact of renewable energy policy on economic growth and the employment in the European Union*, 2009).

### **Green economy as response to the current crisis**

The United Nations Environment Programme (UNEP) published in 2008 a first comprehensive report on the emergence of the green economy in the context of the financial and economic crisis which has affected since the end of 2007 almost all economic sectors. According to this report greening the economy means, among the others, large-scale investments in new technologies, equipment, building and infrastructures, in addition to measures related to greening of education, skill-building and on-the-job training. The shift into a greener economy will generally imply the discouragement of unsustainable patterns of production and consumption. Some key drivers are identified: subsidies (in particular to renewable energy production), tax reforms, measures related to carbon markets' regulation, targets and mandates, extended producers' responsibility laws, eco-labeling, R&D budgets and international aid (UNEP, ILO, IOE, ITUC, *Green jobs: Towards decent work in a sustainable, low-carbon world*, Worldwatch Institute, Washington DC, 2008). In 2009 a report prepared for the Economics and Trade Branch of UNEP Division of Technology, Industry and Economics deeply analysed the multiple faces of the crisis (fuel, food and financial). In this report a new strategy, the Global Green New Deal (GGND) has been proposed. It refers to the need of the right mix of policies which can stimulate recovery and, at the same time, improve the sustainability of the world economy (E.D. Barbier, *A*

*Global Green New Deal*, Report prepared for the Economics and Trade Branch, Division of Technology, Industry and Economics, UNEP, 2009).

The relevance of actions on key environmental challenges related to future economic consequences has been highlighted in a recent work of OECD. In fact natural resources and ecosystem services are now definitely essential to support economic growth, social well-being and human health (OECD, *Green growth: overcoming the crisis and beyond*, Paris, 2009). Drivers of green economy are also a starting point for another OECD analysis which focuses on the ways to generate growth in the different regions. According to the OECD work (OECD, *Regions matter. Economic recovery, innovation and sustainable growth*, Paris, 2009) regional policy is essential in improving sustainable post-crisis growth both at the regional and national levels. The key appears to be how assets are used, how different actors interact and how synergies are exploited. Among the others, it suggests a role for public policy in assuring that growth is maximised from all the assets present in a region. Another contribution on green economy as response to the crisis from a 'technological perspec-

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**The impact of green investments on labour market**

edited by Carlo Stagnaro

tive' has been provided by the International Energy Agency in spring 2009. This work focuses on the need of an Energy Revolution which will help to face the three main challenges: the economic and financial crisis, climate change and energy efficiency. The deployment of existing technologies and the development of new low-carbon technologies are necessary in order to change the current unsustainable trends in energy supply and use. Although with the crisis investments in the energy sectors have generally decreased, mainly because of the lower demand of new products, economic stimulus packages should be considered as

a great starting point both for immediate measures with a short-term impact and for the influence on long-term investment decisions (IEA, *Ensuring Green Growth in a Time of Economic Crisis: the Role of Energy Technology*, paper presented at the G8 in Siracusa, Italy, 2009).

Also the European Union has taken serious steps in this direction. According to the new EU Strategy 2020, which is considered the successor of the Lisbon Strategy, Europe is facing a deep transformation, which is mostly related to changes in employment and labour force composition. The crisis has hit almost all the economic sectors, showing

the need of discouragement of unsustainable patterns of production and consumption. The key priority of this Strategy is in fact to achieve a knowledge-based, connected, greener and more inclusive economy, growing fast and sustainably, creating high levels of employment and social progress (European Commission, *Consultation on the future 'EU 2020' Strategy*, Commission Working Document, COM(2009) 647 final).

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## The occupational impact of green investments: some results

by *Giulia Rossi*

The Report published by UNEP jointly with ILO, IOE and ITUC, in 2008 contains a clear definition of the concept of green jobs, starting from the consideration that there are some jobs which contribute appreciably to maintaining or restoring environmental quality and avoid Earth's future damage. Those jobs, also called 'green jobs', are here defined as those "work in agricultural, manufacturing, research and development, administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials and water consumption

through high-efficiency strategies; de-carbonize the economy and minimize or altogether avoid generation of all forms of waste and pollutions". The conclusions of UNEP's report are that millions of green jobs have been created in the world, in industrialized as well as in developing countries and emerging economies. Renewable energy sector alone has created 2.3 million jobs worldwide and the figures could reach 20 million jobs by 2030. Renewable energies already created more jobs than fossil fuels and investments on them are estimated to reach 630 billion dollars by 2030. Taking the two main examples, the wind energy sector might generate 2.1 million jobs and solar energy some 6.3

million jobs (UNEP, ILO, IOE, ITUC, *Green jobs: Towards decent work in a sustainable, low-carbon world*, Worldwatch Institute, Washington DC, 2008).

There are many studies which demonstrate that investments related to energy efficiency and renewables entail more job opportunities than traditional energy investments. The Monitoring and Modeling Initiative on the Targets of Renewable Energy (MITRE) promoted in 2003 by the European Commission already determined that across Europe, renewable energy development would have a net positive impact on employment (MITRE, *Meeting the targets and putting renewables to work*, country reports produced for the

European Commission, 2003). More recent works, mostly developed in the context of the crisis, confirm these findings. The previously quoted report commissioned by the European Commission, DG Energy and Transport deeply analyses the impact that strong policies in the renewable

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sector could have in terms of both gross domestic product (GDP) growth and employment opportunities. According to this report “policies that support renewable energy sources (RES) give a significant boost to the economy and the number of jobs in the EU. Improving current policies so that the target of 20% RES of final energy consumption in 2020 can be achieved will provide a net effect of about 410,000 additional jobs and 0.24% additional GDP” (Fraunhofer ISI, Ecofys, EEG, Rutter + partner, LEI, SEURECO, *EmployRES. The impact of renewable energy policy on economic growth and the employment in the European Union*, 2009).

Another report which gathers evidence of already existing green jobs and assessment of potential job creation if the EU pursues its 2020 targets has been published in 2009 by the WWF. Taking into account also job loss (and job shift) that will occur in some energy-intensive sectors, according to WWF, “environmentally benign alternatives tend to offer more jobs per unit of investment or unit of industrial capacity” (WWF, *Low carbon jobs for Europe. Current opportunities and future prospects*, 2009). In an August 2009 study, Green-

peace, jointly with the European Renewable Energy Council (EREC), compared two possible scenarios: the Reference Scenario, which is the IEA World Energy Outlook 2007’s projections extrapolated for 2030 and 2050, and the Energy [R]evolution Scenario, which shows how the

world could increase its production of renewable energy by nine times, replacing nuclear and a proportion of coal-fired power, to avoid catastrophic climate change. Greenpeace engaged the Australian-based Institute for Sustainable Futures, which operates within the University of Technology of Sydney, to model the employment effect of the two scenarios, showing a greater potential under the second one. The model calculates the indicative number of jobs that would either be created or lost both by macro geographical area and by technology (Greenpeace, EREC, *Working for the climate. Renewable energy and the green jobs [r]evolution*, 2009).

An estimate of direct wind energy employment in all the EU countries which confirms the exponential growth in term of employment of this specific sector, has been provided by I. Blanco and M. Rodrigues in 2009. By using a thematic survey dispatched to around 1100 organisations from 30 countries, the authors have been able to analyse aspects such as gender distribution, company profile and the shortage of skilled workers reported by wind energy companies. They found a clear relationship between installed MW and

number of jobs, even if it is not possible find a single EU job/MW ratio because differences in the export/import capacity within countries (I. Blanco, G. Rodrigues, *Direct employment in the wind energy sector: an EU study*, in *Energy Policy*, 2009, n. 37, 2847-2857).

A significant divergence from the above presented works is represented by a report of King Juan Carlos University in Spain in March 2009. The aim of the Spanish report is to demonstrate that the “Spanish/EU-style green jobs agenda, now being promoted in the US in fact destroy jobs, detailing this in terms of jobs destroyed per job created and the net destruction per installed MW”. The authors assert that, on average, every green job created in Spain destroyed 2.2 jobs in the broader Spanish economy. They also applied this ration in the US context to estimate expected job loss from North-American renewable energy development and policy. The authors also claim that, because of Spain’s broad support in the construction and production of electricity through renewable sources, Spanish citizens are faced with an increase in electricity rates or increased taxes and a public deficit. (G.A. Calzada et al., *Study of the effects on employment of public aid to renewable energy sources*, Universidad Rey Juan Carlos, March 2009). This report has certainly accelerated the debate on the job potential of green policies. Two months later a response to this study has been provided by researchers at Instituto Sindical de Trabajo, Ambiente y Salud (ISTAS). Here the authors report several arguments against the

King Juan Carlos University's paper, asserting for a lack of validity and technical accuracy. Among the proposed arguments, they argued that in the report there is no evidence of new research but rather an adaptation of existing data from other studies, mostly published before 2006. Moreover the proposed input-output model is based on linear and constant trends which do not take into account – neither for Spain and US – the current economic situation, social dimension and the level of concern about global warming (ISTAS, *Critical Review of the "Study of the Effects on Employment on Public*

*Aid to Renewable Sources"* by G. Calzada, 2009). Another reply to Calzada's paper arrived from the National Renewable Energy Laboratory (NREL) of the US Department of Energy Office of Energy Efficiency and Renewable Energy in August 2009. The published white paper discusses fundamental and technical limitations of the analysis conducted by King Juan Carlos University. NREL response basically agrees with the ISTAS' methodological arguments. Moreover, according to NREL, Calzada's paper "fails to account for important issues such as the role of government in emerging markets, the success of

RE exports in Spain and the fact that induced economic impacts can be attributed to RE deployment" (E. Lantz, S. Tegen, *NREL Response to the Report "Study of the Effects on Employment on Public Aid to Renewable Sources" from King Juan Carlos University*, White Paper NREL/TP-6A2-46261, August 2009).

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## Green economy and female employment Why should be care about a gender mainstreaming approach?

by *Giulia Rossi*

The above quoted contributions to the political and academic debate on green jobs, while offering a wide range of theoretical and empirical tools, show a general lack of gender mainstreaming approach. In general, economic sectors dealing with green investments, including the energy sector, present low share of female employment and entail mostly 'Non-Traditional Occupations'. This raises the concern of a global negative effect on female employment. It also implies that, in addition to the quantitative perspective, a great attention should be put on the quality of the jobs created by green investments and on the impact in terms of social inclusion. Because of

the lack of official statistics and the difficulty to model the gender specific impact, there are not estimates concerning female employment in green sectors. Also from a qualitative prospective, there are very few contributions which analyse the impact of green economy on female employment. In general studies on climate change only deals with gender analysis in terms of women's different energy-use patterns or their under-representation in the standard-setting bodies, arguing for rethinking mitigation policies from a gender point of view (a comprehensive overview on the debate has been recently offered by G. Terry, *No climate justice without gender*

*justice: an overview of the issues*, in *Gender & Development*, 2009, vol. 17).

However, considering women only as passive users and consumers of renewable technologies is just a partial contribution in the debate on sustainable energy importance. According to the background paper for the International Conference for Renewable Energies, which took place in Bonn in 2004, I. Clancy et al. explored the role of women both as energy entrepreneurs and as workers in the energy sector. New entrepreneurial opportunities related to the provision of energy services have been encouraged by the liberalisation of energy markets. Some specific



programmes have been carried out, especially in poor and rural areas. Because of the deep knowledge of local circumstances and local needs, women living in rural areas, if adequately trained, seem to be successful energy entrepreneurs. However, as argued by the authors, often the selection criteria include a previous knowledge of electricity and electrical systems and this criterion rules out most women. To what concern women workers, the energy sector appears characterized by gender segregation, both horizontal and vertical. In addition to the very low share of women employed, they mainly work in administration, sales, finances, catering and personnel, and seems that women have less career advancement opportunities than men. There are different positions concerning the reasons of this gender segregation in the energy sector. Some researches have suggested that the energy sector has an highly masculine image which deters women. However in the recent years technological

progress has reduced the need of significant inputs of muscular labour. Women should be able to choose whether or not to work in the renewable energy sector, and not to be excluded by artificial barriers (J. Clancy, S. Oparocha, U. Roehr, *Gender equity and renewable energies*, thematic background paper for the International Conference for Renewable Energies, Bonn, 2004). A more recent contribution has been provided by a study carried out by Sustainlabour, again under the framework of the project *Strengthening trade union participation in international environmental processes*. This study directly deals with the potential risk of exclusion of women from the green economy, mainly because of gender-segregated employment, discrimination and traditional attitudes. The paper examines the trends in the creation of green jobs, their social quality and their access to women workers. Considering that most green jobs are expected to be in the secondary sectors of construction, manufacturing and

energy production, where women are significantly under-represented, governments and trade unions are required to arrange efficient measures to raise female opportunities. The proposed strategies concern the promotion of anti-discrimination laws and family-friendly mandates, the eventual establishment of quotas and targeted schemes in order to recruit women in non-traditional occupations, targeted apprenticeship and training initiatives, measures aimed at reduce gender-based job segmentation and wage gaps and the rise of the union membership of women in potential green sectors (Sustainlabour, *Green jobs and women workers. Employment, equity, equality*, Draft Report, 2009).

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