Green Jobs

and related policy frameworks

An overview of the European Union

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Content

EXECUTIVE SUMMARY

The green economy offers enormous opportunities for job creation, many of which are already underway in the European economy. These opportunities range from sectors traditionally associated with an environmental content - such as renewable energies or recycling - to other activities that represent emerging sectors in green jobs - such as sustainable mobility - and to activities in "established sectors" which have potential for conversion into sustainable activities.

The importance of emerging green sectors can be seen in the additional benefits they have brought to the European region. Recent estimates by the Eco-Innovation Observatory show that exports of environmental goods and services increased nearly three-fold since 1999, to over €24 billion in 2010.

The EU has devoted more public research resources to environmental-related sciences than any other research system in the world. Between 2006 and 2008 the number of eco-industries sectors' workers increased by 70%, approximately 3.4 million people, and produced 64 % more in turnover, with a total turnover estimated to be more than 300 billion €. Many European companies are implementing eco-innovation and around 27% of innovating companies in the EU have increased their material efficiency as a result of implemented changes. However, there is still a gap between the potential for eco-innovation and the current state of eco-innovation activity in the EU.

Currently though, there is a fast-paced global change taking place to economies which needs to be taken into account. This is reflected not only in the austerity policies that have been implemented throughout Europe, but also in many other countries outside de European Union that are carrying out ambitious stimulus plans - plans which, very often, target green sectors. An example is the renewable energy sector. The uncertainty in the sector in the USA and Europe contrast with new investments and policy support which are allocated to sector development in developing countries. Motivations range across the wish to promote their national resources, or cut their dependence on imported oil, or address increased power demands to create new and green jobs. Significant renewable energy investments have been directed to India, Turkey, Morocco, South Africa and Brazil. Other countries with lower GDPs are also supporting the sector: from the Philippines, which has recently established its National Renewable energy Programme with $27.6 billion by 2030 in dedicated investments, to African countries such as Kenya and Uganda that have established different supporting schemes such as Feed in Tariffs (FiT) to all renewable energy sources.

To effectively assess this, up-to-date figures are needed that, on one hand, reflect the multiple impacts of austerity policies and a prolonged financial crisis and on the other hand include these recent ambitious investments being carried out by a number of countries outside Europe.

As mentioned, the austerity backdrop, especially in recent years, means many studies are now out of date with the European reality. Unemployment in the 17 EU countries that use the euro rose to 11.8 percent in November 2012, as the number of jobless people in the region rose to 18.8 million, the highest figure since the single currency was founded in 1999. The unemployment rate for the 27 member European Union stood at 10.7 percent, unchanged from October, but up from 10.0 percent a year ago. The number of unemployed across the whole EU topped 26 million. Some recent studies in Europe have demonstrated that these sectors have weathered the recession better than others by retaining more employment, and hence they would be particularly well situated for a future scenario of investment intended for the recovery of European economies. Nonetheless, the mass job losses imply green jobs are also being lost.

I. Employment data in green sectors in Europe

According to the data available, there are about 7,360,000 jobs in the EU in green sectors (renewable energies, energy efficiency, retrofitting, organic agriculture, waste management and

recycling). The renewable energy sector employs more than 1,114,000 people in the EU-27. The eco-industry provides between 2.9-3.6 million jobs. The European insulation industry alone represented 232,050 full time jobs in 2009 in house retrofitting projects. The railway sector totted up 900,000 jobs across Europe in the transport of goods and passengers. Another relevant figure is the number of urban public transport jobs, around 900,000 in EU-25. The employment associated with waste management and recycling sectors reached 2 million jobs and there are 200,000 producers linked to organic farming.

However, it should be noted that there is a lack of reliable, comprehensive and comparable data on green jobs in the European Union, the lack of a standard definition of green jobs being one of the main reasons.

In terms of sectors, renewable energies, followed by waste management and recycling and sustainable transportation are the sectors were more jobs have been created. Countries with higher number of green jobs are Germany, Spain and Italy with green jobs in renewable energy production.

The lack of a common definition has resulted in highly differing figures for present green jobs and future potential in the Union. In order to overcome this challenge, in 2010 the EU Commission published the report “Towards a greener labour market – The employment dimension of tackling environmental challenges” which includes a set of indicators to define green jobs1. The Commission warned about applying a too narrow definition of the “green economy” or “green jobs” that would risk missing out on the wider economic and labour market effects of the environmental challenge that are, in many ways, comparable to the challenges of globalisation, technological change or ageing. The EU Commission also warned on the need for environmental policies to be assessed against their employment impact and recommended giving preference to instruments that are efficient in reaching environmental goals and, at the same time, employment-friendly.

Moreover, the EU Commission acknowledged that employment policies can actively contribute to mitigate environmental change by encouraging greener production methods, greener work practices, greener transport and commuting. Public administration and public enterprises can lead by example in this respect, and also by raising public awareness about environmental issues in general and green employment in particular.

Taking into account the limitations concerning the green jobs definition, a non-comprehensive compilation of green jobs' figures in Europe is summarized in the following table:

[1] See report: Towards a greener labour market – The employment dimension of tackling environmental challenges” here: http://ec.europa.eu/social/main.jsp?catId=370&langId=en&featuresId=63&furtherFeatures=yes

GREEN SECTOR	Existing green jobs (2007, 2008, 2009, 2010, 2012)	Number of jobs/€ invested[2]	Potential for green jobs creation in 2020	Potential for green jobs creation in 2030	Potential for green jobs creation in 2050	Other data	Source of information
Eco-industries[3]	**2.9-3.6 million in 2008**						(ECORYS, 2009)
	1,245,614 jobs in environmental management activities in 2008						(ECORYS, 2009)
Energy Efficiency in buildings	**232,050 Jobs in EU insulation industry**	25,900 total jobs/1 bill €	261,400-378,000 new jobs			**250,000 new jobs annually** if eco-efficient refurbishment rates increase 4%	*(CECODHAS, 2009)*
Renewable energy	**1,114,210 jobs in 2010**	52,700 total jobs/ €1billion investments	**2.7 million** *(based on, 20% RE target)*	**4.4 million** *(based on 45% RE target)*	**6.1 million** *(based on 100% RE target)*		*(Eurobserv'ER 2011)*
Efficient transport & sustainable mobility	**900,000** jobs in urban transport **900,000 jobs** in railway for freight and passengers **2.1 million** in efficient transport	21,500 total jobs/ €1billion investments				70% more jobs per unit of investment in public transport than in building new road and bridge construction	(UITP for EU25) (Eurostat for EU27) (FoE, 2009) (Smart Growth America, 2011)
Organic farming	**220,000-260,000 producers** in 2009 **197,000 holdings** in 2008	6,600 total jobs/ €1billion investments				10-20% more jobs per hectare than conventional farms	(FIBL, 2009) (Farm Structure Survey, 2007)
Biodiveristy conservation		29,000 total jobs/ 1 € bill investments					
Waste & recycling sector	**2 million jobs** in 2008: 1,466,673 jobs in waste management and 512,337 jobs in recycling	21,300 total jobs/ €1billion investments (70% recycling rate)	**2,400,000** jobs (50% recycling rate) **2,963,000** jobs (70% recycling sector)			Recycling 10,000 tonnes of waste create between 6 and 12 more jobs than incineration and 25 more jobs than landfill deposition	

[2] According to the GHK study- Evaluating the potential for Green Jobs in the next Multi-annual Financial Framework", Daly E., Pieterse M., Medhurst J.,August 2011. http://www.birdlife.org/eu/pdfs/Green_Jobs.pdf

[3] Eco-industries are defined as activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use. (The Environmental Goods and Services Industry – Manual for Data Collection and Analysis", OECD/Eurostat, 1999)

Green Jobs in Renewable Energy sector

The total employment impact of an investment of €1 billion per annum in renewable energy is 52,700 net jobs - the highest rate among the green sectors. The European Union continues to lead the world in clean energy investments, spending nearly $81 billion in 2010. Since 2009, China invested $54.4 billion in clean energy technologies in 2010 compared to the United States' $34 billion. Over 85 percent of today's market for clean energy technologies is primarily in Asia and Europe (EuroObserv'ER 2012).

At a national level, Germany leads Europe both in market size and job creation related to renewable energies with 361,360 workers followed by France with 174,735 jobs and Italy with 108, 150 jobs in the sector.

In the world, Germany's clean energy investments of $41.2 billion came second in 2010, after China, surpassing the United States which is now in third place. Also high on the list were Danish wind manufacturers, who produced close to 22 percent of annual global installed wind capacity (Pew Centre, 2011).

Renewable energy sectors employ more than 1,114,000 people in the 27 European Union Member States in 2010. This is a 25% increase on the 2009 figure of 912,220. And this could increase exponentially: if a target was reached of 100% renewable energy by 2050, employment in the renewable energy sector would bring 6.1 million people into work.

The major employer is solid biomass with more than 273,000 jobs (direct and indirect full time jobs), followed by solar photovoltaic and wind power which employ respectively 268,110 and 253,145 estimated jobs in 2010.

However, there are also some difficulties to overcome. The lack of training programmes and guidelines for planners and architects are identified as being among the most severe barriers for renewable energy development. The training gap applies to a whole range of skilled people: from installers, to maintenance personnel, engineers and public servants. From a suppliers' point of view, the lack of skilled personnel prevents or delays the installation of new systems, equipment or specific parts in the installation process.

Biomass. The biomass sub-sector has a crucial role in creating revenue in the Member States. The use of solid biomass has increased 8% in the European Union in 2010. The economic value for construction, manufacturing and installation along with activities related to biomass supply was € 4.6 billion, while the number of jobs remained stable in 2010 (273,150). The main major biomass user and industry countries are the Nordic countries of Sweden and Finland, followed by Germany and France, then Poland and Romania in Eastern Europe. (EBIA 2012).

Solar Photovoltaic (PV). Estimations put industry turnover at €35-45 billion for 2010, turning this sector into the largest business segment - by far - of all RES technologies. European Photovoltaic Industry Association (EPIA) takes a European benchmark of 30 jobs per newly installed MWp. The average installation costs for <100 kWp roof mounted systems dropped from a mean of just under € 4,000/kWp early in 2009 to just under € 3,000/kWp early in 2010, and to € 2 546/kWp early in 2011. At the global level Solar photovoltaics (including modules, system components, and installation) increased from $71.2 billion in 2010 to a record $91.6 billion in 2011. Projections suggest the market will continue to expand to $130.5 billion by 2021. (CleanEdge, 2012)

In the solar PV sector, Germany, France and Italy job numbers have increased by more than 70%. However, these numbers have been reducing in the last two years in some countries due to policy changes in the sector. In Spain, estimations indicate a reduction of about 20,000 jobs in the entire sector. In solar photovoltaic energy alone, there has been a reduction of 10,000 jobs due to the knock on effects of the government's decision to declare a moratorium and where projects were abandoned. The objective was to reduce public investments to cope with the current economic

crisis the country is going through. Germany still holds an unassailable lead over its nearest rivals in the jobs league with more than twice as many jobs as in France and over three times as many as in Italy.

Austerity policies are nonetheless damaging progress: Greece, France and the U.K. have slashed subsidies for solar power since the recession began in 2008, and Germany has announced it will eliminate government support for solar panels by 2015. Spain halted subsidies for new renewable-energy projects altogether in 2012.

Wind. Despite a sluggish market for newly-installed capacity, turnover and employment are more or less stable. This is firstly due to a number of Eastern European markets, such as Poland and Rumania, which have significantly built up their capacities and secondly, the European offshore market which has grown recently- most notably in the United Kingdom. In addition, European wind industry players' expertise is valued in other world markets. Leading manufacturers display higher export shares and have gone to emerging markets in China and the US (EWEA, 2012).

Solar thermal. The 2008 financial crisis and the current economic recession have negatively affected the solar thermal sector. In its annual statistical, the European Solar Thermal Industry Federation (ESTIF) quantified annual European industry turnover at € 2.6 billion and a workforce of 33,500 people, largely in SMEs, which are selling, planning, installing and servicing solar thermal systems (€ 3 billion and 37,500 in 2009). (ESTIF 2009)

Geothermal energy. Whereas geothermal electric power plants are found in only a few countries, 22 of the 27 European Union states are now using geothermal heat. The geothermal workforce dedicated to exploration, drilling, installation, operation and maintenance consists of more than 12,500 people.

Biogas. The sector count is roughly 53,000 jobs in the EU27. Jobs and value are created by investment in new facilities, but also require a substantial amount of operation and maintenance and a significant labour force on the agricultural side. Across Europe, farmers have started to generate additional profit by growing energy crops or substrates as biogas plant input. Stronger regulations need to be implemented to guarantee safety.

Energy efficiency- buildings

Energy efficiency activities are more labour-intensive than manufacturing. The leverage of public and private funding is often between ten and five to one, translating as 1 million Euros of public money can lead to investments of between five and ten million Euros. The employment effect of an investment of €1 billion in housing renovation in the European Union is the creation of 25,900 full time jobs: 15,000 direct jobs and 10,900 indirect jobs.

According to the European Council for an Energy Efficient Economy (ECEEE), to create maximum impact through an Energy Efficiency Directive there must be a parallel jobs strategy to ensure a comprehensive approach to implementation.

In Spain, job numbers in the energy efficiency sector ranked behind the chemical industry and car manufacture sectors, and ahead of the textile, metal and also electricity production and distribution. This represented 1.81% of the total gross added value. Sectors involved in the programme which are maximising impact on jobs are transport (33.6% of total jobs) and construction (30.8%).

Retrofitting and construction projects often rely on labour-intensive, locally-implemented projects and can lower unemployment rates. Additionally, new technologies which require a high level of expertise for their development, implementation and user training, while achieving a necessary level of the market capacity for energy efficiency can also boost the associated retail and consulting industries. This implies that direct and indirect impacts may stretch far beyond the construction industry, and hence have a genuine multiplication effect.

The sector is held back by skill shortages. The skills of all those working in the area will have to undergo a transition, whether minor or substantial. This will affect a much greater number of workers: in the EU-25, for instance, about 16.7 million workers in related occupations are estimated to be affected.

Sustainable mobility

The transition for a green transport sector will impact the labour market by creating new green jobs and greening the existing ones. New jobs are created in new and expanding areas (bicycle infrastructure, electric bicycle production, urban space design, mobility management), existing jobs are adapted to make them greener (electricians or plumbers travelling to work by cargo bicycle rather than by car, and driving instructors teaching about more energy efficient driving techniques), whereas some other jobs are substituted (a shift from road to rail freight would lead to job loss in the former area but job gain in the latter area) and finally some jobs are eliminated (some jobs currently existing in the automobile industry).

The potential employment effect of investing €1 billion in sustainable transport in Europe is 21,500 full time jobs: 16,700 jobs associated with constructing new infrastructure and manufacturing new transport vehicles/equipment, the supply of materials for the construction of sustainable transport infrastructures and the manufacture of transport vehicles equipment; and 4,800 jobs created by increases in household spending by those employed in direct and indirect jobs. Even though a sustainable transport policy may ultimately lead to fewer jobs in car manufacturing and related fields such as vehicle retailing and repair services, it offers more jobs in manufacturing of buses, light railways, subways, and railways; in the provision of the required infrastructure for these modes of transport (including tracks, signals, stations, etc.); and in planning, running, and maintaining transport systems (bus drivers, conductors, and other operators; route planners, maintenance staff, etc.). (EU Parliament, 2010).

For the EU 25, estimates suggest around 900,000 people are employed in urban public transport. The number of direct jobs in public transport amounts to about 1–2 percent of total employment. Public transport investments in Europe have an average job multiplier effect of 2 to 2.5

Organic farming

Various attempts have been made to quantify the employment dividend of organic farming in Europe and studies have generally found that organic farms employ more people than nonorganic farms. The main elements of organic farming which contribute to higher employment include: small, more diverse farms with mixed systems (crops and livestock); varied crop rotations; careful soil management; maintaining the positive health of plants and animals; rearing farm animals outdoors to high welfare standards; and maintaining habitats for natural predators and other wildlife, all these activities are more labour intensive than the those in intensive agriculture (House of Commons. Environment, Food and Rural Affairs Committee, 2008).

One review of over 40 European studies found that, on average, organic farms provided 10 to 20% more jobs per hectare. Organic Works, a 2006 survey from the UK's Soil Association, found organic farming in the UK provides 32% more jobs per farm than equivalent non-organic farms, while organic farmers in the UK were on average seven years younger than non-organic farmers.

The direct, indirect and induced employment effects of a €1 billion investment into measures to conserve wildlife, maintain and enhance landscape quality and character, protect natural resources, protect the historic environment and promote public access and understanding of the countryside is 6,600 full time jobs.

Recycling

A growing body of evidence indicates that the recycling industry generates more jobs at higher income levels than landfilling or incinerating waste. Recycling has roughly twice the economic

impact of burying the same amount of materials in the ground. If waste management and recycling industries in the EU represented around 2 million jobs in 2008, full compliance with EU waste policy, 50% for recycling, could create an additional 400000 jobs according to the European Commission.

Nearly 80% of total direct jobs are in the EU15 countries, with Germany, France, Poland and the UK accounting for almost two thirds of employment in the sector. Employment is particularly high as a percentage of the workforce in Austria, Denmark, Estonia and Slovenia. In Germany the waste and recycling sector is bigger than either steel or telecommunications.

The EU has expanded paper and plastics recycling through growth in export, particularly to China. While past employment studies have focused on domestic jobs, future expansion of recycling which partially relies on exporting could create overseas jobs at the expense of EU based employment opportunities. It follows therefore that the more opportunities there are for 'closed loop' recycling within the EU, the lower the number of jobs that are likely to migrate to other countries.

Biodiversity

The number of jobs provided directly and indirectly by biodiversity and ecosystem services is significant in the EU. In the European Union, it is estimated that 14.6 million jobs, in other words 7% of the labour market, are directly related to biodiversity (FEEM 2011).

Nevertheless, more sustainable farming and forestry practices offer potential both to maintain biodiversity and to enhance employment by supporting safer, more lasting jobs linked to local livelihoods rather than centralised systems of production. Nature conservation and ecotourism also offer opportunities for skilled, knowledge-based and sometimes relatively well paid employment, often helping to diversify local economies and the employment opportunities they provide (FEEM, 2011).

The EU has a total forest area of approximately 177 million ha (around 40% of the EU territory), of which 130 million ha are available for wood supply and the production of non-wood goods and services (e.g. cork, resins, berries, mushrooms, hunting). The forest-based industries are a very important EU economic sector (woodworking industries, pulp and paper, printing industries), with a production value of € 365 billion, and an added value of around € 120 billion created by more than 3 million jobs.

Negative effects on employment

Environmental change itself and policy efforts aimed at more sustainable growth have important feedbacks on the labour markets: they affect how and what is produced and how work is organised. The dynamics of labour market outcomes are complex and difficult to predict (EU Employment Committee (EMCO), 2010). Policies aimed at greening the economy might imply some degree of labour reallocation. In turn, this require appropriate labour market policies that address mismatches between the demand and supply of employment and skills, ensure that the transitions are fair for all, and foster the direct and indirect creation of jobs.

Localities that have specialised in what will eventually become declining sectors (e.g. fossil fuel production) will face the challenge of developing new specialisations. Green growth will provide new opportunities for local economic development initiatives.

Some green technologies may initially have a higher than average labour intensity, differences in labour intensity are likely to diminish over time once initial investments have been made, and new green technologies mature and become more productive, as is the case with all type of industrial sectors. It is crucial to take all these factors into account to develop economic policies in Europe that maximize both environmental benefits and quality job creation, and also minimize negative effects.

III. The question of quality

It should be noted that there is a gap in information regarding the quality of green jobs. There are very few reports that analyze the different quality dimensions: wages, occupational health and safety, accidents, gender, to what extent green jobs are covered by collective bargaining, and so forth. Green jobs, in most situations, are jobs in new sectors, and thus are not organized –both at workers and employers' level and their occupational health risks are not fully assessed.

In terms of quality of employment, conditions vary greatly among sectors and research is scarce.

As stated in the report "Study on employment associated to the promotion of renewable energies in Spain in 2010" by ISTAS 83,7% of staff in the renewable energy sector are on permanent employment contracts; the remaining workers are on temporary contracts (14,1%), training (0,9%) or are self-employed (1,2%). However, the report notes that a high level of subcontracted companies working on less added value tasks might mean that their working conditions as well as their qualifications are lower. In terms of qualifications, most workers in the renewable energy sector are higher education graduates and qualified workers. Subcontracted companies render lower qualification jobs (ISTAS, 2010).

The research undertaken, by the Work and Life Quality in New and Growing Jobs (WALQING), in Australia, Bulgaria, Denmark and Italy shows that working conditions in the waste sector in Europe faces important challenges. In Southern and Eastern Europe especially, boundaries between the informal and illegal sectors are permeable. Outside the public sector, where unions have traditionally been strong, coverage of collective working agreements is patchy. Social dialogue at the EU level is not yet formalised in the waste sector. It has become clear that the sector requires investment in developing forums and modes of social dialogue, from some institution-building in the less organised countries and segments of the sector to the extension of social dialogue beyond the traditional actors and issues (WALQING, 2012).

As previously mentioned there is a gap in research on the quality of green jobs, and also for incomes. The research into income considerations of a lower carbon economy carried out by the International Labour Organization and the International Institute for Labour Studies in 2011 found that the top 15 emitting industries employed 12% of all workers in the EU-25 and 9.5% in the EU-15 Member States. The percentages are lowest among Sweden and Denmark and are highest in Poland and Slovenia.

In the EU-15, nearly 30% of workers in the top 15 emitting industries are low skilled compared with less than 20% in the low carbon intensive sectors.

While wage shares in the high-carbon intensive sectors (HCIS) tend to be higher in comparison with the low-carbon intensive sectors (LCIS), across EU groups, wage shares in the top 15 emitting industries are systematically lower and incurred slightly larger declines in the decade between 1995 and 2005 in comparison with both the LCIS and the HCIS.

The green transition will require the development of a better understanding of the implications of health and safety and green jobs at the workplace. Additionally, measures aimed at environmentally friendly workplaces can help to improve working environments, having a positive impact on worker's health and safety. In order to shape the future of occupational health and safety in green jobs and inform EU decision makers, Member States' Governments, trade unions and employers, the European Agency for Safety and Health at work carried out a research about the new and emerging risks associated with green technologies by 2020 (EU-OSHA, 2011).

Gender aspects

The majority of green jobs are estimated to be in the construction, manufacturing and engineering fields where woman are significantly under-represented. As a result, the green economy may unintentionally exclude women. The more skilled building positions –metal workers, insulation specialists, cement masons, plumbers and pipe fitters, carpenters, electricians, heating and cooling experts– are male dominated in all countries. In the energy industry, the share of female employees is estimated at 20%, most of them working in non technical fields such as administration and public relations (ILO, 2007). From a global perspective, primary sectors, including agriculture and forestry, are expected to be major beneficiaries of the transition to a low-carbon economy. However, women comprise less than 20% of the global formal workforce in primary sectors and around 2% in developed countries. (Sustainlabour, 2009)

EU-wide statistics on green jobs and women have not been assessed yet. Eurostat presents a very limited array of disaggregated data including information regarding green sectors. In most Member States the gender gap in employment rates remains substantial. This is particularly the case in Greece, Italy, and Malta where the employment rate for men is more than 20 percentage points higher than that for women (EU Commission, 2010). In Sweden, rates of female green jobs are available. Statistics from the Swedish Government show that the presence of women is higher in the tertiary sector. The highest share rates are in education research and monitoring (54%), eco-tourism (49%), and environmental consultants (41%). Regarding other sectors, the number of women employed is significant in the solar energy sector (31%). (Swedish Government, 2009).

Skills for green jobs

The European Union's new strategy for sustainable growth and jobs, Europe 2020, puts innovation and green growth at the heart of its blueprint for competitiveness. However, there are no explicit overarching national strategies targeting the green skills needs (CEDEFOP, ILO 2010). There is a lot of variety among Member States in skills programmes for green jobs due to their differing social, economical and environmental conditions. Some Member States are moving faster than others to rectify this, with France launching its recent mobilisation plan for green jobs, and the UK government recently launching a consultation exercise, entitled Meeting the low carbon skills challenge (BIS, 2010).

These programmes tend to be driven by employment demand and often by the implementation of environmental legislation that requires sectors to train their staff to meet new or stricter regulation. The actual content of training and programmes varies across industries and is often tailored to specific companies needs (ECORYS, 2010; CEDEFOP, ILO, 2010)

Currently, there are not enough trainers and teachers who are aware of environmental issues and able to teach new techniques. Shortages are particularly acute in the energy, agriculture and construction sectors.

IV. European employers' organizations and trade unions' work on environment and social dialogue

Both workers and business organizations have extensive experience in the environment and have participated in the different public consultations organized by the Commissions specifically on climate change, energy and energy efficiency.

The European social dialogue has brought many results, notably the adoption of some 60 joint texts by the inter-professional social partners: this process supplements the national social dialogues existing in the majority of the Member States.

Employer associations have undertaken a broad range of initiatives with a view to contributing to mitigating climate change. Companies and employer organisations have sought to:

• engage in political debates on green topics in multi-stakeholder forums and in bilateral dialogues;

• issue publications on specific green issues such as environmental legislation, reducing emissions, remaining competitive in a green economy and employer involvement;

• organise events and information dissemination for awareness-raising among members;

• promote green skills for employees in order to prevent skill deficits

Trade union involvement in environmental issues – and climate change in particular – has increased noticeably in recent years. They are demanding a voice in policy decisions related to greening processes and creating green jobs, and maintain strongly that social and environment interests go hand in hand. Their proposals cover sectors throughout the whole economy and not only new green sectors. Unions are active at either the national, sectoral, plant or individual level under different systems of industrial relations and legal frameworks.

ETUC played a pioneering role in studying the links between environmental and employment policies. In 2007 they carried out a study that considered the challenges for employment of the transition towards a lower CO_2 European economy at the horizon 2030, in four key economic sectors: energy production, transport, steel and cement industries, construction/housing.

Currently ETUC is focusing on European action by calling for a "Sustainable New Deal" or a European Global Compact to curb increasing inequalities, rising poverty and exclusion, soaring unemployment, work insecurity that particularly affects young people, and growing disillusion with the European project. In this strategy better consultation with stakeholders and a new emphasis on collective bargaining and social dialogue are essential.

Fundamentally, trade unions are calling for the re-launch of growth policies and overcoming austerity. These growth policies will need to prioritize green sectors. European industrial and investment policies should be aimed at meeting the economic and environmental challenges; priority should be given to investments in sustainable infrastructure, research and development, climate technology and renewable resources. Also, these investments should not be included in the calculation of public deficits.

V. European regulatory and policy framework

An assessment of different initiatives and policies put forward by the European Commission to promote a more sustainable economy shows that environmental policies, in particular those related to renewable energy and climate change, mainly trigger creation of green jobs.

The EU also acknowledges that greening the economy is a multidimensional challenge and therefore must be addressed through cross-cutting measures at the sectoral level that include targeted economic, employment and skills development policies along with industrial development, innovation and competitiveness policies.

A number of European Commission Departments, the so-called Directorate Generals (DG), have developed initiatives related to green jobs that range from just identification of green jobs potential to specific regulation with objectives and goals at national level. The list of DGs involved in green jobs policies include Economic and Financial Affairs, Employment, Social Affairs and Inclusion, Enterprise and Industry, Climate Action, Mobility and Transport, Energy, Environment, Research and Innovation and Agriculture and Rural Development.

Regarding the nature of these measures which promote a more sustainable economy, voluntary objectives outnumber binding measures. The number of voluntary agreements, strategies, plans, communication initiatives and campaigns are larger than any specific laws, regulations and programmes with explicit budgets attached.

The energy and climate change policies also known as the EU 2020 energy and climate package, deserves special mention. The EU 2020 energy and climate package included the adoption of EU Directives with mandatory and quantitative national objectives on energy and climate, such as the target of 20% renewable energy production by 2020 across the EU that has resulted in an increase in the renewable energy sector and related-industry and the creation of new green jobs.

In terms of timeframes, two different strategies should be highlighted: a short term perspective, as a direct result of the EU 2020 strategy, and 2050 as the reference year for long term action, which is the year considered at international climate discussions to decisively cut down greenhouse gas emissions (GHG) at the global level.

Green job policies have been triggered by the need for the EU to combine two different objectives: on one hand an EU strategy facing up to ambitious environmental goals and on the other the creation of jobs, reduction of unemployment and increasing competitiveness - all at the EU level. The increasing environmental awareness both at a national and international degree should be noted as one of the key reasons for environmental policy development in the Union. Global negotiations in UN environmental summits, particularly on climate change at the United Nations Framework Convention on Climate Change (UNFCCC) and the UN Conference on Sustainable Development played a significant role in the definition of EU environmental policies in an increasingly globalized international scenario.

In terms of employment and labour policies, the EU has carried out a number of assessments, research studies and information exchanges among countries on two thematic issues: Firstly, green jobs potential and employment impact of policies to protect the environment and secondly, skills needed for the new green jobs to be created in environmentally-friendly sectors.

Furthermore, in the interests of overcoming the impacts of the financial and economic crisis, the EU adopted a series of economic stimulus packages that included investments to promote green sectors and sustainable growth (although in smaller percentages than in other regions of the world). A limited number of assessments of the results of these stimulus packages have been undertaken after four years of being carried out. In the meanwhile, austerity policies and cutbacks have been implemented by some EU countries. These measures have oftentimes focused on green sectors (renewable energies, in particular) while measures to support other less environmentally-friendly sectors such as the automotive sector or the construction have been left untouched. Essentially, such policies are preventing sustainable sectors, and not only green jobs, from continuing to grow.

In addition to the impacts of austerity measures on green jobs, the economic crisis itself has resulted in further negative environmental consequences: the decline of industrial production due to the slump has resulted in a dramatic fall of CO_2 price at the carbon market, which in fact has hit a historical minimum and is heavily affecting the work of the European Emissions Trade system (ETS). The ETS is considered to be an essential instrument in promoting both renovation of the industrial network and also investment in clean and low greenhouse emissions.

I. Definition of green jobs

There are several definitions for “green jobs.” One of the first and most applied by research and policy-makers is the one from the report Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World4, published in September 2008 by the United Nations Environmental Programme (UNEP), International Labour Organization (ILO, International Trade Union Confederation (ITUC) and the International Organization of Employers (IOE). The report defines Green jobs as jobs created, under decent work conditions, in activities that reduce environmental impacts of sectors, companies and economies. The definition further considers green jobs as “green” 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."

As it is widely recognised, “green jobs” is an evolving concept and therefore it is difficult to give a strict definition. This dynamic concept is based on the fact that each new technology, product or service might evolve in a more efficient replacement in terms of energy and material consumption, emission and other particle pollution emissions. This fact makes it fairly complicated to define with clear boundaries what can be considered as a green sector, an eco-industry or green jobs.

Furthermore, every sector can be categorized in different sub-sectors according to the different levels of environmental impacts. The automotive industry is a good example of these environmentally-friendly subsectors as well as of the evolving nature of green jobs: new hybrid and less pollutant vehicles are considered by many as green sectors and workers of these sectors are counted as having green jobs. However, other analyses with a more restrictive approach to the concept of green jobs only consider as sustainable sector those associated to collective and public transport (bus, train, subway, bikes) and the employment associated to them as green jobs. It is clear that these two different assumptions of what green sectors and green jobs are produce different final figures.

In addition, the difference between so-called green jobs and environmental jobs should be noted. The latter refers to those jobs that depend on natural resources and the environment at some level (use of water, land, biodiversity, etc). A good example of these jobs is jobs in agriculture. However, green jobs refer to those jobs that can be created as a result of a reduction of the environmental impact of any process. Employment in organic agriculture, energy efficiency and recycling are good examples of this category.

This document compiles information from the most relevant research available on the issue of green jobs. However, the majority of this research unfortunately only takes into account the environmental dimension of green jobs and does not take into consideration the employment dimension. Thus, figures of green jobs included in this report are closer to the ILO and UNEP definition. The issues related to green jobs quality, following ITUC definition is addressed in section III of the report.

Disparity of data and definition of Green Jobs in the EU

Information on sustainable development differs greatly among EU Member States. Statistical data by Member States on environmental activities do not follow the Eurostat5 guidelines on classification and perimeter of statistical control of products and activities in all cases, nor studies produced by NGOs and other organizations in these countries. As a result, official green jobs

4“Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World”: http://www.unep.org/PDF/UNEPGreenJobs_report08.pdf

5 “The environmental goods and services sector” Eurostat 2009. http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-09-012/EN/KS-RA-09-012-EN.PDF

statistics are not available which makes comparison of information from different EU countries extremely difficult.

Other definitions of green jobs are compiled in the box below:

Defining Green Jobs[6]

UNEP

The United Nations Environmental Programme (UNEP) defines green jobs "… as work in agricultural, manufacturing, research and development (R&D), administrative, and service activities that contribute substantially to preserving or restoring environmental quality. Specifically, but not exclusively, this includes jobs that help to protect ecosystems and biodiversity; reduce energy, materials, and water consumption through high-efficiency strategies; de-carbonize the economy; and minimize or altogether avoid generation of all forms of waste and pollution."

ILO

"Green jobs" does not lend itself to a tight definition but certainly includes the direct employment which reduces environmental impact ultimately to levels that are sustainable. This includes jobs that help to reduce the consumption of energy and raw materials, decarbonizes the economy, protect and restore ecosystems and biodiversity and minimize the production of waste and pollution. […] A somewhat wider concept of "green jobs" might embrace any new job in a sector which has a lower than average environmental footprint, contributes to improving overall performance, albeit perhaps only marginally."

Eurostat: Environmental goods and services sector (EGSS)

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

International Trade Union Confederation (ITUC) "A Green Job should be one which reduces environmental impacts of enterprises and economic sectors, while providing decent working and living conditions to all those involved in production and ensuring workers' and labour rights are respected[7]"-

Sources: UNEP (2008), ILO (2008), Eurostat and ITUC (2010)

[6] Definitions considered by the EU Employment Commission in its paper "Towards a greener labour market – The employment dimension of tackling environmental challenges"

7 Information in this section can be found here:" Green and Decent Jobs. Making The "Green Economy" http://climate.ituc-csi.org/IMG/pdf/01-GreenJobsEN_Final.pdf

II. Employment data in green sectors in Europe

As already said, there is a lack of reliable, comprehensive and comparable data about green jobs in the European Union due largely to the fact that there is no common or standard definition of green jobs.

An example of the significant variations in the final figures due to the different definition applied to green jobs can be found in the World Wildlife Fund for Nature (WWF) report, the (WWF) that assessed the figures of green jobs available in different EU countries. The report “Low carbon jobs for Europe” concludes that the present direct jobs complement in Europe in the field of renewable energy, sustainable mobility and energy-efficient products and services amounts to at least 3.4 million. However, the ECORYS’s report by using a wider definition of activities directly associated with the environment and with improvement of resource efficiency showed that green employment would reach up to 19 million direct jobs in the EU-27. Under this approach, the whole labour force in the agriculture sector will be considered green, since their activity relies on the environment; meanwhile a more restrictive definition on green jobs should only include organic farming as a green sector.

Creating new green jobs and transforming the existing ones mean a transformation of the entire economy and the labour market resulting in a better local and global environment, reduction of climate change, biodiversity loss and other global challenges but should also bring better working conditions ensuring that green jobs are also decent jobs and a fairer access to natural resources and incomes, which could make overall, a more sustainable economy.

As mentioned before, existing literature on the issue has mainly focussed on the quantitative employment side, providing information about the creation of green jobs in new green sectors and about the net employment effect of greening the economy with frequent references to jobs “maintained” or “saved” as a result of these measures.

Due to the lack of official statistics, those researches that have carried out studies across Europe to identify green sectors and estimate the current and the potential jobs have, used different methodologies and various units of measurement, for instance: direct, indirect, induced and/or total jobs. The key green sectors described in the following section and their main figures are summarized in the following table, taking into account the limitations mentioned above.

Summary table of green jobs in EU by sectors:

GREEN SECTOR	Existing green jobs (2007, 2008, 2009, 2010, 2012)	Number of jobs/€ invested[8]	Potential for green jobs creation in 2020	Potential for green jobs creation in 2030	Potential for green jobs creation in 2050	Other data	Source of information
Eco-industries[9]	**2.9-3.6 million in 2008**						(ECORYS, 2009)
	1,245,614 jobs in environmental management activities in 2008						(ECORYS, 2009)
Energy Efficiency in buildings	**232,050 Jobs in EU insulation industry**	25,900 total jobs/1 bill €	261,400-378,000 new jobs			**250,000 new jobs annually** if eco-efficient refurbishment rates increase 4%	*(CECODHAS, 2009)*
Renewable energy	**1,114,210 jobs in 2010**	52,700 total jobs/ €1billion investments	**2.7 million** *(based on, 20% RE target)*	**4.4 million** *(based on 45% RE target)*	**6.1 million** *(based on 100% RE target)*		*(Eurobserv'ER 2011)*
Efficient transport & sustainable mobility	**900,000** jobs in urban transport **900,000 jobs** in railway for freight and passengers **2.1 million** in efficient transport	21,500 total jobs/ €1billion investments				70% more jobs per unit of investment in public transport than in building new road and bridge construction	(UITP for EU25) (Eurostat for EU27) (FoE, 2009) (Smart Growth America, 2011)
Organic farming	**220,000-260,000 producers** in 2009 **197,000 holdings** in 2008	6,600 total jobs/ €1billion investments				10-20% more jobs per hectare than conventional farms	(FIBL, 2009) (Farm Structure Survey, 2007)
Biodiveristy conservation		29,000 total jobs/ 1 € bill investments					
Waste & recycling sector	**2 million jobs** in 2008: 1,466,673 jobs in waste management and 512,337 jobs in recycling	21,300 total jobs/ €1billion investments (70% recycling rate)	**2,400,000** jobs (50% recycling rate) **2,963,000** jobs (70% recycling sector)			Recycling 10,000 tonnes of waste create between 6 and 12 more jobs than incineration and 25 more jobs than landfill deposition	

Source: compiled by the author based on the different resources

[8] According to the GHK study- Evaluating the potential for Green Jobs in the next Multi-annual Financial Framework", Daly E., Pieterse M., Medhurst J.,August 2011. http://www.birdlife.org/eu/pdfs/Green_Jobs.pdf

[9] Eco-industries are defined as activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. This includes cleaner technologies, products and services that reduce environmental risk and minimise pollution and resource use. (The Environmental Goods and Services Industry – Manual for Data Collection and Analysis", OECD/Eurostat, 1999)

Low carbon economy as a driver of new green jobs

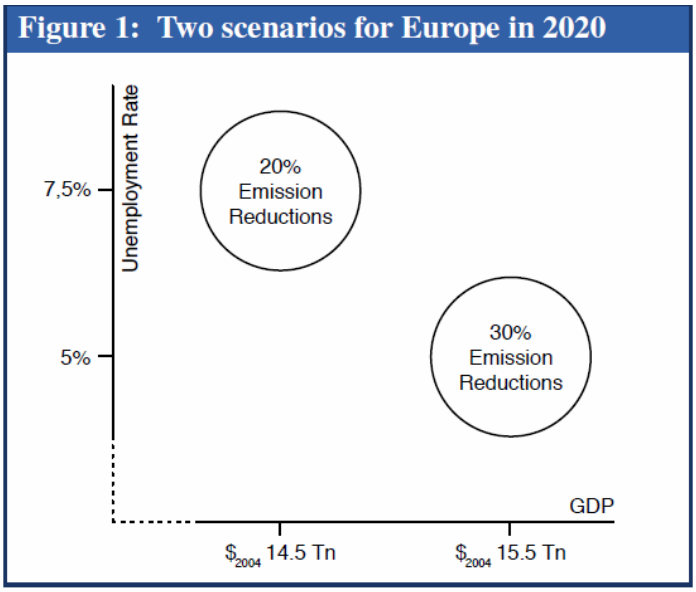
In the coming decades, Europe will need to face the challenge of increasing economic growth while reducing both unemployment and greenhouse gas emissions. According to the study "A New Growth Path for Europe: Generating Prosperity and Jobs in the Low-Carbon Economy" (European Climate Forum, 2011) these three goals can actually reinforce one another and Europe can revitalize its economy by tackling the climate challenge.

Raising the European climate target from 20% to 30% emissions reductions can foster the following outcomes by 2020:

- Increase the growth rate of the European economy by up to 0.6% per year.
- Create up to 6 million additional jobs Europe-wide.
- Boost European investments from 18% to up to 22% of GDP.
- Increase European GDP by up to $842 bn.
- Increase GDP by up to 6% both in the old (EU15) and new (EU12) member states.

Two scenarios for Europe in 2020

Figure 1: Two scenarios for Europe in 2020



Source: own analysis based on GEM-E3 simulations.

Source: A New Growth Path for Europe. Generating Prosperity and Jobs in the Low-Carbon Economy. Study commissioned by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety.

Europe, a worldwide leader in green technology

The last report on Innovation Union Competitiveness, published in 2011 by the Directorate General for Research and Innovation of European Commission, show that EU governments invested on average in 2009 almost EUR 5 per inhabitant, while South Korea invested around EUR 4 and the United States and Japan around EUR 2. That meant that the EU devoted more public research resources to environmental-related sciences than any other research system in the world. Moreover, the EU accounts for around 43 % of all the climate change mitigation related patents

filed under the Patent Cooperation Treaty (PCT). However, updated employment figures that take into account the effect of austerity measures and the long-effect economic crisis along with the effects of the ambitious measures and investments plans undertaken by other countries outside Europe, in particular China, are urgently needed.

Between 2000 and 2007, innovation in climate-change mitigation technologies intensified rapidly. The number of patents which addressed challenges increased considerably in most countries and represented approximately 2 % of total patent applications in this period of time. Denmark, the Netherlands, Germany and Japan are the countries which patent most in this area relative to their GDP. In volume, Germany and Japan concentrate a large share of these patents in the world, as well as the United States, despite its lower value in relation to GDP (half of the EU). In the EU, Germany is the largest R&D investor, representing 34 % of all EU's patents. The United Kingdom and France follow with 13 % and 8 %, while the rest of the EU countries account for 40.5 % of all EU's patents, i.e. 14 % of the world total. The United States and Japan account for 21 % and 20 % of all these patents respectively.

Job creation in European eco-industries

In order to understand how the eco-industry sector has evolved in the EU we can compare the analysis carried out by the consultancy company ECORYS (former ECOTEC) in 2002 and 2008.

In 2002, according to the "Analysis of the EU Eco-Industries, their Employment and Export Potential" the EU eco-industries supplied some 183 bn Euro of goods and services a year. Direct employment in the EU in eco-industries amounted to over 2 million full time jobs – around 1.5 million jobs for pollution management and 650,000 for resources management. Areas such as nature protection and organic farming were identified as potential sector for employment creation in rural economies.

Environmental Domains comprising the EU Eco-industries Market

Eco-industry Group	Environmental Domain (Sub-Sector)
Pollution Management*	Air Pollution Control (ACP)
	Waste Water Treatment (WWT)
	Waste Management (WM)
	Remediation and Clean up of Soil and Groundwater
	Noise and Vibration Control
	Environmental Monitoring and Instrumentation
	Environmental Research and Development
	Public Environmental Administration
	Private Environmental Management
Resources Management	Water supply
	Recycled Materials
	Nature Protection

(*) Pollution Management includes all investments in Cleaner Technologies and Processes. Such investments will be incorporated primary into values for APC, WWT and WM.

Total employment generated by the demand for environmental goods and services was at least 2.6 million jobs taking into account the indirect effects on the rest of the economy. These indirect jobs

include, for example, jobs in supply of electricity to the ecoindustry, as well as jobs in a range of other industries that supply (non-environmental) goods and services to ensure that environmental infrastructure remains fully operational (e.g. maintenance firms). Including induced jobs[10], a high end estimate of environmental employment was around 4 million jobs.

In 2002 environmental sector employment accounted for on average 1.3% of total paid employment in the EU-15, although it was higher in countries like Austria, Denmark and France. At this time, employment was expanding in the waste management sector.

In 2008, six years later, the ECORYS' research "Study on the Competitiveness of the EU eco-industry" found that eco-industries employed approximately 3.4 million of people, and the total turnover was estimated to be more than 300 billion €, that means 70% more jobs and 64 % more in turn over.

Employment of the various EU Eco-Industry sub-sectors and the growth rates of employment and EPE (corrected for inflation)

	Employment (2000)	Employment (2008)	Employment: annual growth rate	EPE: annual growth rate corrected for inflation
Waste management	844.766	1.466.673	7,14%	5,89 %
Water supply	417.763	703.758	6,74%	4,04%
Wastewater	253.554	302.958	2,25%	3,62%
Recycled material	229.286	512.337	10,57%	13,12%
Others	129.313	193.854	5,19%	6,23 %
Renewable energy	49.756	167.283	13,37%	17,65%
Air pollution	22.600	19.067	-2,10%	3,10%
Biodiversity	39.667	49.196	2,73%	5,29%
Soil and Groundwater	14.882	18.412	2,70%	3,02%
Noise and Vibration	4.176	7.565	7,71%	3,02%
Total	2.005.764	3.441.102	6,98%	6,69%

Source: Data from Eurostat compiled by Ecotec (2000), Ecorys (2008).

Exports of environmental goods: Recent estimates by the Eco-Innovation Observatory show that exports of environmental goods and services increased nearly three-fold since 1999, to over €24 billion in 2010.

Eco-innovation and business: The report "The Eco-Innovation Gap: An economic opportunity for business" highlights that many European companies are implementing eco-innovation and around 27% of innovating companies in the EU have increased their material efficiency as a result of implemented changes. However, there is still a gap between the potential for eco-innovation and the current state of eco-innovation activity in the EU.

The main characteristic of the EU eco-industry is undoubtedly its diversity, in comparison to other industries. The type of activities range from high-tech and complex services in e.g. renewable energy and air pollution control to mature and well established applications in recycling and waste treatment. SMEs are especially present in air pollution control and eco-construction.

[10] Induced jobs are those jobs created in all sectors of the economy as a results of the expenditures made by direct and indirect jobs.

Yet in the older sub-sectors such as waste treatment and collection large and multinational companies are the major actors. Recycling is a case in particular with large companies at the top of the collection and processing chain and a base of SMEs that collect, sort and process at smaller scale and feed their output into the production of the larger ones[11].

Green Tech[12] creating jobs in Germany

The importance of environmental technology and environmental innovations to the German economy shows how this sector is increasingly emerging as an engine of growth and employment. Environmental technology will therefore continue to drive employment in the years ahead – provided that environmental policy remains progressive and innovation-friendly.

An estimated 1.8 million people work in the field of environmental protection. Creating and safeguarding jobs, and raising competitiveness are central motivations for choosing a pro-environment, pro-innovation policy.

Between 2005 and 2007, the workforces increased by an average of 14%. This finding proves that the impact of environmental technology on employment has now become tremendously important to the German labour market. As with revenue growth, the lead market for environmentally friendly power generation and storage also leads the way in creating new employment.

Since around 90% of German companies' value chains are based in their home country, the environmental technology industry is creating jobs primarily in Germany. Only 10% of value is added abroad, so domestic employment is correspondingly high.

Source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. "Green Tech made in Germany 2.0. Environmental Technology Atlas for Germany". 2009

Labour market impacts of green job creation

Environmental change itself and policy efforts aimed at more sustainable growth have important feedbacks on the labour markets: they affect how and what is produced and how work is organised. The dynamics of labour market outcomes are complex and difficult to predict. (EU Employment Committee (EMCO), 2010)

Policies aimed at greening the economy might imply some degree of labour reallocation. In turn, this will require appropriate labour market policies that address mismatches between the demand and supply of employment and skills, ensuring that the transitions are fair for all, and foster the direct and indirect creation of jobs.

Localities that are specialised in what will eventually become declining sectors (e.g. fossil fuel production) will face the challenge of developing new specialisations. Though, green growth provides numerous new opportunities for local economic development initiative, some green technologies may initially have a higher than average labour intensity, differences in labour intensity are likely to diminish over time once initial investments have been made, and new green technologies mature and become more productive, as is the case with all type of industrial sectors. (EU Employment Committee (EMCO), 2010). Taking into account all these factors is key to develop economic policies in Europe to maximize environmental effects and decent work creation while minimizing the negative consequences.

[11] *"Study on the Competitiveness of the EU eco-industry"* ECORYS 2009

[12] The report focuses on sectors where Germany has a comparative advantage, clean tech as well as production and innovation in mobility. To a lesser extent it includes basic or core environmental protection tasks such as traditional waste management or soil remediation.

Green Jobs by sector

Renewable energy

In 2010, the European Union continued to lead the world in clean energy investments, spending nearly $81 billion. However, the situation is rapidly changing. Since 2009, China has invested in clean energy technologies. (not clear if the money was a total from 2010 or simply since 2009) $54.4 billion in 2010 compared to the United States' $34 billion. Over 85 percent of today's market for clean energy technologies is primarily in Asia and Europe. (EuroObserv'ER 2012)

The economic activity of the 27 European Union Member States for 2010 on renewable energies was higher than 127 billion Euros, 15% higher than the 2009 figure. The photovoltaic sector, with 45,564 million Euros in Europe's markets, took it past wind power as the top earner. The solid biomass sector is placed in third after solar photovoltaic and wind power.

At national level, Germany leads Europe both in market size and job creation related to renewable energies. Germany's clean energy investments of $41.2 billion were the second in 2010 at global level, after China, surpassing the United States that is now at the third place. Danish wind manufacturers produce close to 22 percent of annual global installed wind capacity. (Pew Center, 2011)

Jobs in the renewable energy sector include jobs in planning, design and implementation of renewable energy technologies, as well as jobs associated with the operation and maintenance of this infrastructure and agriculture, linked to the demand for bioenergy crops, agriculture jobs, and employment associated with refining biofuels, and supply of equipment such as tractors as well as machines to manufacture wind-turbines. The total employment impact of an investment of €1 billion per annum in renewable energy is 52,700 net jobs, that includes the creation of 25,900 direct jobs in the production and installation of renewable energy, 19,400 indirect jobs in the sectors supplying goods and services to the renewable sector and 7,500 induced jobs; and the loss of the 100 indirect jobs from the displaced activities in the conventional energy sector. (GHK, 2011)

Green jobs in the renewable energy sector

The recent report "The State of Renewable Energies in Europe", published by EurObserv'ER in 2012, found that renewable energy sectors had more than 1,114,000 people employed in the 27 European Union Member States in 2010. This is a 25% increase on the 2009 figure of 912,220. (EuroObserv'ER 2012)

The major employer is solid biomass with more than 273,000 jobs (direct and indirect full time jobs), followed by solar photovoltaic and wind power with respectively 268,110 and 253,145 jobs estimated for 2010.

Germany still holds an unassailable lead over its nearest rivals in the jobs league with more than twice as many jobs as in France and over three times as many as in Italy.

Biomass: This biomass sub-sector has a crucial role in creating turnover in the Member States. The use of solid biomass increased 8% in the European Union in 2010. Investments are made for the installation of biomass power (and/or heat) plants and the accompanying equipment and the sale of solid biomass boilers, furnaces or stoves for individual households. Furthermore, the forestry sectors are major employers, where the energy input is created and delivered to end-users (EuroObserv'ER 2012).

Biomass-conversion technology's dual uses as both electricity and heat is a major asset, together with the multitude of forms taken by biomass – wood chips, timber, pellets, sawdust, logwood, pulp, etc. The economic value for construction, manufacturing and installation, and the biomass supply side was €4.6 billion, and the jobs were stable in 2010 (273,150). The main major biomass user and industry countries are the Nordic countries of Sweden and Finland, followed by Germany and France, then Poland and Romania in Eastern Europe (EBIA 2012).

Solar energy photovoltaic: For the first time, in 2010 Europe's photovoltaic sector installed more new capacity than any other renewable electricity source over the year (over 13 GWp of new capacity). Cell and module production thrives throughout Europe, although major production centres are now to be found elsewhere, primarily in China, Taiwan and the USA. Nevertheless, the economic effects created in EU countries stem from the massive installation activity, the production of equipment, operation and maintenance activities. The employment level increased by 70% to 268,110 individuals employed, compared to 2009 (EPIA 2012).

Business in the solar photovoltaic sector surged in 2010, which led to a 50% increase in job numbers and in countries such as Germany, France and Italy, job numbers expanded by more than 70%. (EuroObserv'ER 2012). However, these numbers have been reduced in the last two years in some countries due to the unfortunate policy changes in the sector. In Spain, a reduction of about 20,000 jobs in the entire sector is estimated. In solar photovoltaic energy alone, there is a reduction of 10,000 jobs due to the abandonment of projects after the suspension of procedures to pre-assign remuneration and the suppression of economic incentives for new electric energy production based on cogeneration, renewable energy sources and waste products (Sustainlabour, 2012). This decision was taken by the government in the framework of the austerity measures to deal with the current economic crisis

It is estimated that industry turnover number €35-45 billion for 2010, turning this sector into the largest business segment by far of all RES technologies. European Photovoltaic Industry Association (EPIA) assumes a European benchmark of 30 jobs per newly installed MWp. The average installation costs for <100 kWp roof mounted systems dropped from a mean of just under €4,000/kWp early in 2009 to just under € 3,000/kWp early in 2010, and to €2,546/kWp early in 2011 according to the German Solar Industry Association (BSW).

Wind energy sector turnover was over €29 billion for 2010 (against €31 billion in 2009) and employed 253,000 workers in the EU.

Despite a sluggish market for newly-installed capacity, turnover and employment are more or less stable. First explanation is that a number of Eastern European markets, as Poland and Romania, have built up capacities significantly. These developments have partly offset the sluggish performance of their long-established neighbouring markets (Spain, Germany, France, and Italy that still represent the core of employment and economic value in Europe). Secondly, the European offshore market, most notably in the United Kingdom.

Finally, it can be seen that the European wind industry players' is operating in other world markets. Leading manufacturers display higher export shares and have gone to emerging markets in China and the US, (EWEA, 2012) driven sometimes by a stronger support to the industry from these countries- This development has to be monitored to foresee impacts in employment.

Solar thermal: The 2008 financial crisis and the current economic recession have negatively affected the solar thermal sector. This sector has contracted in the major markets (Spain, Austria, Germany, and France). The slowdown in the building construction segment is another negative factor for market in Spain where the installation of solar thermal systems is legally binding in new buildings. The weight of the sector is around 49,000 jobs (down 9% from 54 000 the year before) and €3.8 billion (down from € 4 billion). In its annual statistical, the European Solar Thermal Industry Federation (ESTIF) quantified annual European industry turnover at €2.6 billion and a

workforce of 33,500 people, largely in SMEs, which are selling, planning, installing and servicing solar thermal systems (€3 billion and 37,500 in 2009). (EurObserv'ER 2011)

Hydropower is the most mature renewable energy technology in the EU with turnover and employment generated and maintained by manufacturing electromechanical equipment for hydro installations and by civil engineering (the construction of dams, the refurbishment and up-grading of existing hydro plants) or by operation and maintenance. The hydro power industry in the EU is focused on re-licensing and repowering plants as well as adding hydro generation to existing dams. Installed net capacity up to 10 MW has grown slowly but steadily over the last few years to reach 13,066 MW to date. The trend for gross electricity production has also been slightly positive.

The small hydro sector was stable in 2010, accounting for just over €2.6 billion and a workforce of 16,000 across the EU-27 countries. European Small Hydro Association (ESHA) estimates similar figures. Investment costs (in € per kW) vary wildly from €1500-7000 across Europe. The main countries using hydropower in terms of turnover and jobs are Austria, Italy, France, Spain, and Germany.

Geothermal energy: Geothermal energy can be used as heat or electricity. Whereas geothermal electric power plants are found in only a few countries, 22 of the 27 European Union are now using geothermal heat. Investment costs for deep geothermal projects are relatively high, due to comprehensive site assessment and drilling activities. Employment is also generated in equipment manufacturing and O&M activities in the EU. The geothermal workforce in exploration, drilling, installation and O&M consists of more than 12,500 people.

Biogas: 2010 saw a remarkably high 31% growth of primary energy production from biogas (agricultural plants, landfill and sewage gas, and other deposits). The major European biogas markets are Germany, the United Kingdom and Italy, Poland and France. The sector counts roughly 53,000 jobs in the EU27. Jobs and value are created by investment in new facilities, but also require a substantial amount of operation and maintenance and a significant labour force on the agricultural side. Across Europe, farmers have started to generate additional benefit by growing energy crops or substrates as biogas plant input; much more attention has to be given to safety issues.

Bioethanol and biodiesel: Biofuels production is a controversial issue from the point of view of their sustainability. The real effect on emission reduction and the consequences on food price of biofuel production at global level bring up serious sustainability concerns.

Regarding figures in Europe, the growth in bioethanol fuel consumption (26.1% between 2009 and 2010) outpaced that of biodiesel consumption (11.1%), yet biodiesel still accounts for three-quarters of European biofuel consumption. On the assumption of 0.007 jobs per toe for biodiesel and vegetable oil production, and 16 jobs per million litres of ethanol produced, employment number 150,000 jobs in 2010 in the EU27 (including the downstream activities of biofuel production plants and the distribution sector and the upstream activities – the agricultural supply chain for biofuel).

Ground source heat pump and waste: According to the Renewable Energy Directive, the ground source heat pumps and the 50% of the municipal waste are considered renewable energy sources to meet the renewable energy targets by 2020. Nearly 40,000 individuals are directly and indirectly employed in the European Ground Source Heat Pump sector and put the number of jobs at around 25,390 in 20 countries that are either covered by Confederation of European Waste- Energy Plants.

2010 Distribution of employment by sector

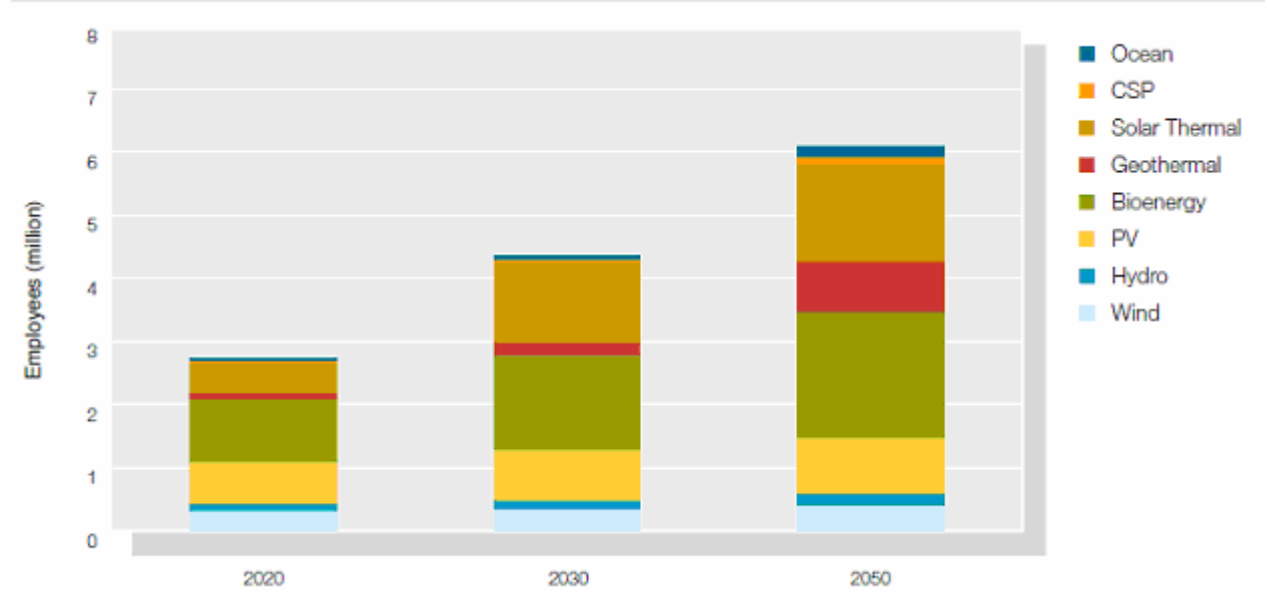
	Country total	Solid biomass	Photovoltaic	Wind power	Biofuels	Biogas	Solar thermal	Ground heat pumps	Waste	Small hydropower	Geothermal energy
Germany	361,360	60,900	107,800	96,100	23,100	38,000	13,100	12,000	6,660	2,400	1,300
France	174,7365	60,000	58,100	20,600	15,200	965	8,070	3,800	3,700	2,500	1,800
Italy	108,150	7,000	45,000	28,600	9,900	2,600	4,900	150	1,000	3,000	6,000
Spain	98,300	8,000	19,500	30,750	29,000	1,350	6,000	0	1,500	1,600	600
Sweden	54,780	26,500	750	4,500	6,200	500	380	11,500	3,000	1,450	n.a.
Finland	48,620	35,000	100	6,400	3,200	300	<50	2,900	250	420	0
Austria	41,600	17,400	4,400	3,300	7,900	1,500	4,700	1,100	150	1,100	50
Denmark	36,400	5,800	400	25,000	1,300	700	450	100	2,500	50	100
United Kingdom	31,700	2,000	5,000	9,200	5,300	6,000	900	1,500	1,500	250	<50
Poland	28,450	7,500	<50	7,000	9,600	1,000	1,250	1,500	<50	300	200
Belgium	22,670	2,700	6,200	3,000	9,400	0	420	450	250	50	200
Czech Republic	20,200	3,500	8,000	350	5,800	0	1,400	800	50	300	n.a.
Netherlands	19,180	250	2,300	2,600	4,000	1,880	1,420	1,700	4,480	<50	500
Portugal	17,450	3,700	3,500	4,450	3,000	0	1,875	100	300	400	100
Romania	16,800	13,500	<50	1,500	750	<50	250	100	n.a.	400	200
Greece	12,920	3,000	4,250	1,570	350	0	3,000	100	n.a.	550	100
Hungary	11,550	2,000	100	1,400	6,600	<50	150	400	50	<50	750
Latvia	9,300	5,500	<50	<50	3,500	<50	<50	100	<50	50	n.a.
Slovakia	7,030	800	1,000	0	4,500	<50	130	50	<50	300	150
Lithuania	5,850	3,000	<50	900	1,500	<50	<50	150	n.a.	<50	100
Bulgaria	5,470	1,100	350	3,000	300	<50	70	100	n.a.	300	200
Ireland	3,500	600	<50	2,000	350	0	300	100	<50	<50	n.a.
Slovenia	3,375	1,800	800	0	250	165	60	50	<50	100	100
Estonia	3,100	1,500	<50	350	<50	<50	<50	1,000	n.a.	<50	0
Cyprus	1,095	50	160	475	<50	<50	310	0	n.a.	0	0
Luxembourg	500	50	<50	<50	<50	<50	<50	100	<50	<50	0
Malta	150	0	<50	0	<50	<50	50	0	n.a.	0	0
Total	**1,114,210**	**273,150**	**268,110**	**253,145**	**151,200**	**52,810**	**49,485**	**39,850**	**25,690**	**15,970**	**12,550**

Source: EurObserv'ER 2011

Job potential in renewable energy by 2020, 2030 and 2050

There are quite a number of reports available about job creation potential result of a more ambitious transition towards renewable energy production. A good example is the "A 100% Renewable Energy Vision for the European Union" report, the European Renewable Energy Council[13] proposed a pathway to achieve 100% renewable in the energy sector. Considering that a target of 45% renewable energy in final energy consumption in 2030 is met, this would provide gross employment of about 4.4 million in the renewable energy sector – an annual average growth rate of about 6% on 2020 (2.7 million employees). (EREC, 2010) If a target of 100% renewable energy by 2050 was followed, employment in the renewable energy sector would bring 6.1 million people into work. This constitutes an average annual increase of gross employment of 36% and 30% respectively compared to 2009.

Gross Employment in the Renewable Energy Sector (2020-2030-2050)



Source: EREC, 2011

Workforce skills in the renewable energy sector

The renewable energy industry offers a variety of high-quality jobs in very different technologies. In Spain, for instance, the renewable energy sector has a high level of qualification workforce, 55% of the workers in this sector are either engineers or higher education graduates. Only 11% are non-qualified workers (ISTAS, 2011).

In the last two decades, most of the debate concerning the promotion of renewables was focused on the financial support schemes and on improving grid access conditions for renewable electricity.

[13] EREC, the European Renewable Energy Council, is the umbrella organisation of the major European renewable energy industry, trade and research associations active in the field of photovoltaic, small hydropower, solar thermal, bioenergy, ocean & marine, geothermal, wind energy, and solar thermal electricity. EREC' members: AEBIOM (European Biomass Association), EGEC (European Geothermal Energy Council), EPIA (European Photovoltaic Industry Association), EREF (European Renewable Energies Federation), ESHA (European Small Hydropower Association), ESTELA (European Solar Thermal Electricity Association), ESTIF (European Solar Thermal Industry Federation), EUBIA (European Biomass Industry Association), EU-OEA (European Ocean Energy Association), EUREC Agency (European Renewable Energy Centres Agency), EWEA (European Wind Energy Association).

However, during the last few years, the importance of tackling non-financial and non-technical barriers to renewable electricity, heat and transport has gained the attention of many policy analysts.

In the report “Assessment of Non-Cost Barriers to Renewable Energy Growth in EU Member States” commissioned by the EU Directorate-General for Energy and Transport of the European Commission, the lack of training programmes and guidelines for planners and architects are identified among the most severe barriers for renewable energy development.

In general, there is a lack of sufficient training in Member States- this might be directly linked to the lack of a certifying body and guidelines for designers. The training gap applies to a whole range of skilled people: from installers, to maintenance personnel, engineers and public servants. From a supply side of view, the lack of skilled personnel prevents or delays the installation of new systems, equipment or specific parts in the installation process. For already installed systems and plants maintenance is not done properly or not at all, ultimately hampering renewable energy in the long run. From a demand perspective, there is common fear that in case the equipment fails to work; repairing will be delayed resulting in consumers not installing renewable technologies.

Besides the need to create new skills, there is also a need for upgrading old skills for professional target groups such as electricians and plumbers. In some countries, training of installers takes place via learning-on-the-job or from senior colleagues, which is quite common in the Netherlands for instance. Other initiatives include workshops, seminars and small courses which are provided by a wide variety of providers such as trade unions, manufacturers, RES associations and governmental institutions. However, these forms of training are not sufficient to remove entirely the barrier of lack of training. RES technology installation, planning, maintenance, etc. should be an integral part of the vocational, higher or academic schooling.

The lack of clear guidelines and directions for spatial planners, architects and other designers has an impact through missed opportunities and planning. It is assumable that they do not have the training and background to include RES into their designs. Clear guidelines should counterbalance this problem, whereby spatial planners can reserve space for RES systems within the landscape, architects keeping room for RES systems in buildings and grid planners for extra capacity in likely RES sites. Currently, these guidelines are absent or insufficient throughout the Union. Exemptions include Estonia and Italy.

Energy Efficiency Refurbishment

Energy efficiency activities are more labour-intensive than manufacturing. The leverage of public and private funding is often between ten and five to one, meaning 1 million Euros of public money can lead to investments of between five and ten million Euros. That means the creation of between 85 to 190 jobs for 1 million Euros of public money spending. (JANSSEN, 2012)

Changes in household income, due to reduced energy bills for householders as a result of the energy efficiency measures, will affect employment in the wider economy; with increases in sectors providing consumer goods and services as a result of the spending of energy savings. But the reduced energy demand will reduce the level of employment in the energy supply industry. The employment effect of an investment of €1 billion in housing renovation in the European Union is the creation of 25,900 full time jobs: 15,000 direct jobs and 10,900 indirect jobs. (GHK, 2011)

It has been estimated that increasing the annual eco-efficient refurbishment rates to 4%, the equivalent of 800,000 units in Europe's social and cooperative housing stock alone would create 250,000 jobs annually and make a significant contribution to reaching the EU's energy efficiency targets. The estimated annual expenditure requirement for this renovation boom is €16 billion. (CECODHAS, 2009)

According to the European Council for an Energy Efficient Economy (ECEEE), for maximum impact of an Energy Efficiency Directive there must be a parallel jobs strategy to ensure a comprehensive approach to implementation.

The ECORYS' study "The number of Jobs dependent on the Environment and Resource Efficiency improvements" indicates that European insulation industry employed 232.050 full time jobs in 2009 (61.250 in manufacturing and 170.800 in installation) and it was (if referring to 2009) hoped that the recast of the European Building Performance Directive (EPBD) would (if referring to 2009) spur investment in public and private buildings.

Based on market studies and the impact assessment for the EPBD, the growth scenarios assumed were for annually: 1, 2% in a low growth scenario, 2, 2% in a medium growth scenario and 5% for a high growth scenario. The turnover of the industry in 2020 is expected to range from EUR 23.7 billion in a low growth scenario to EUR 34.3 billion in a high growth scenario. In terms of employment, the range is from 261,400 in the low growth scenario to 378,000 in the high-growth scenario.

300,000 jobs in the sector of energy efficiency in Spain by 2020

The new Action Plan for Energy Saving and Efficiency (Plan de Acción de Ahorro y Eficiencia Energética 2011-2020), adopted by the Spanish government in 2011, includes an analysis of the socio-economic impact of the energy efficiency sector, specifically in terms of production, added value and employment. This is the first national estimate on the effects of energy efficiency policies on job creation.

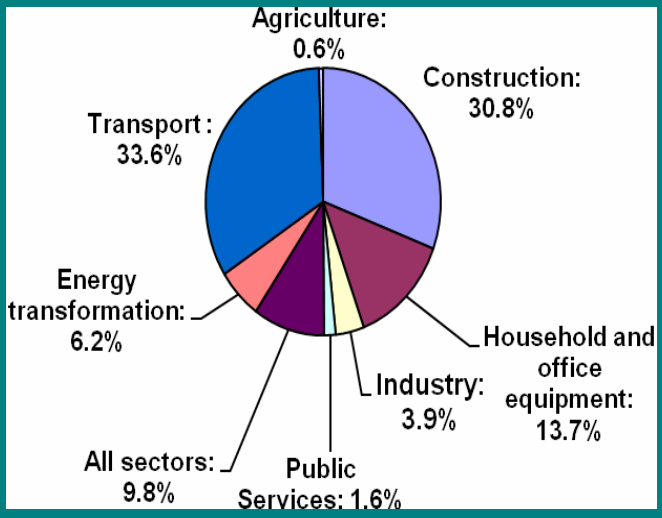
The sector of energy efficiency created 106,393 direct jobs (0.5% of jobs in Spain) in 2009, of which 77.7% corresponded to male workers and 22.3% to female. For the number of jobs the sector of energy efficiency ranked behind the chemical industry and car manufacture sectors, and ahead the textile, metal and production and distribution of electricity.

The total impact (direct, indirect and induced effect) on the employment of the energy efficiency sector is 281,473 jobs or 1.4% of total jobs in the Spanish economy. These jobs represent 1.81% of the total gross added value (17,771 million of Euro).

The sectors involved in the programme with more impact on jobs are transport (33.6% of total jobs) and construction (30.8%). Construction in the energy efficiency sector represented 76,514 jobs, of which 32,744 were direct jobs.

Estimates on total jobs en the energy efficiency sector of Spain are 762,698 jobs for 2020, of which 288,290 would be direct jobs.

Graphic 6.2 Distribution by sectors of direct effects of the energy saving and efficiency plan 2009 in terms of jobs (%)



Source: Socio-economic impact of Energy Saving and Efficiency for 2012-2020, IDAE, 2011

Occupations and skills related to energy efficiency measures in buildings

Retrofitting and construction projects often rely on labour-intensive, locally-implemented projects and can lower unemployment rates. On the other hand, new technologies require a high level of expertise for their development, implementation and user training, while achieving a necessary level of the market capacity. The energy efficiency can also boost the associated retail and consulting industries. This implies that direct and indirect impacts may stretch far beyond the construction industry, having a genuine multiplication effect.

As suggested by the European Economic and Social Committee (EESC) there is a need to examine the costs and benefits of energy efficiency measures and the social-employment dimension, the impact on working conditions, social analyses and standards, tools for evaluating estimated employment, qualifications and vocational training needs as a result of these measures.

According to the research "Greening of the building sector" conducted by the International Labour Organization together with the EU Commission the sector is held back by skill shortages. Skills-led strategies can drive green building forward. The report classified the core occupations into six clusters, relating directly to the green building value chain:

- Conceiving, planning, designing and advising occupations;
- Construction, installation, maintenance occupations;
- Controlling occupations;
- Enabling occupations;
- Manufacturing and distribution occupations;
- Green building clients.

Jobs to improve energy efficiency require high technical qualifications, such as engineering or architectural degrees. Re-training of existing jobs is also needed. There will be a demand for financial specialists, construction engineers, behavior specialists, project managers, auditors, data base managers, policy analysts and the like.

The skills of all those working in the area will have to undergo a transition, whether minor or substantial. It will therefore affect a much greater number of workers: in the EU-25, for instance, about 16.7 million workers in related occupations are estimated to be affected. Eurostat statistical database provides an indication on occupational composition of related sectors (NACE14 41, 43 and 71) and volumes of workforce involved in them (see figures 2 and 3).

In relation to the gender dimension, much need to be done: the sector is largely dominated by men with a somewhat higher share of female workers in architectural and engineering activities, technical testing and analysis (NACE 71). (ILO, 2011).

Women in eco-construction

A good example of an approach that could be put in place was identified in the Alsace region in France, with the initiative Les Elles du BTP (Women of the Construction Sector). As the construction sector is becoming greener, new skills and training is required to meet the needs of new regulations and energy-efficiency standards. This was perceived as a good opportunity to make use of these trainings in order to involve women in the sector. The initiative Les Elles du BTP aims at facilitating the insertion of women in the construction sector notably through customized training, a network of women in the construction sector who share their experience, and a 'taste' of the different jobs available in the sector. Les Elles du BTP is an initiative that seeks to communicate the possibilities to women to work in the construction sector as well as to raise awareness among business owners and large companies of the advantages to hire women in the sector. Several reports have been prepared in this sense.

Source: Enabling Local Green Growth. Addressing Climate Change Effects on Employment and Local Development, OECD, 2012

[14] NACE (Nomenclature des Activités Économiques dans la Communauté Européenne) is a European industry standard classification system for classifying business activities.

Core occupation in green building

Core occupations in Green Buildings			
Conceiving, planning, designing and advising	Construction Company Managers and Business Functions Architects and Civil/Structural / Environmental Engineers Architectural Technicians / Technical Drawing Specialists HVAC, Electrical, Mechanical, Sanitary, RE and Building Services Engineers/ Designers Surveyors Energy and Water Efficiency and Waste Management Analyst, Consultants and Advisors		
Construction, Installation and maintenance	Building Site Supervisors, Site Engineers and Site Architects		
	Conservation	Insulation/ Weatherization	Bricklayers, carpenters, Plasterers, Glaziers, Masons, Roofers, as well as semi-skilled occupations that assist
		Efficient Heating and Cooling	Plumbers and heating Installers, maintenances HVAC installers Electricians and IT Technicians
		Conservation of Electric Power (other than electric heating and cooling)	Electricians, and Installers of Energy Management System (at domestic level, mostly responsibility of individual householders to choose energy efficient appliances and lighting technologies)
		Water conservation	Plumbers
	Building level Renewable Energy (and High Efficiency Energy) Systems	Heating/Cooling	Installers, maintainers of solar thermal systems Installers, maintainers of wood pellet and other biomass heating systems Installers, maintainers of mass heating (large building or district) and combined heat and Power Systems Heat Pump Installers, maintainers
		Electricity	Installers, maintainers of solar PV Installers, maintainers of small Scale Wind Energy Systems
Controlling	Energy Auditors Inspectors, Certifiers and Quality Controllers		
Enabling	Policy Makers/Urban Planners/Financing Educators and Information Providers/Researchers		
Manufacturing and distribution	Manufacturers and Distributors of Green Buildings Materials and Products IT and System Technicians		
Green building clients	Developers Energy Managers, Facilities Managers and Buildings Managers Public Servants Working in Procurement and Management of Buildings Householders and Tenants		

Source: “Greening the building sector” ILO, EU. 2011

Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary

In Hungary buildings are considered key in the response to the climate challenge since they are responsible for approximately half of energy-related CO2 emissions and have the highest cost-effective climate change mitigation potential. If their efficiency was improved, it would reduce up to 85% of the Hungarian heating energy use and the corresponding CO2 emissions, but also advance energy security, social welfare, reduce energy poverty, create new business opportunities, as well as improve air and life quality, and health.

The annual net employment benefit would reach 131,000 jobs by 2020, including the losses in the energy supply sector. Up to 38% of the employment gains are due to the indirect effects on other sectors that supply the construction industry and the induced effects from the increased spending power of higher employment levels. In addition, the length of the programme would ensure that the jobs created are long-term, and the fact that the whole building stock is considered for renovation implies that the new jobs are likely to be distributed throughout the country as renovations are usually carried out by local small and medium enterprises.

The study focused on existing residential and public sector buildings, as those are the two sectors where most policy intervention/public support is warranted and where the highest social and political benefits can be found. New buildings are outside the scope of the study.

The research assesses scenarios that support “deep” retrofits; bring the buildings as close to passive house standards (i.e. a consumption of 15 kWh/m2/year for heating) as realistically and economically feasible. Scenarios considered ranged from business as usual (business-as-usual renovation rate (1.3% of the total floor area) that means negligible improvement in energy efficiency) to the most ambitious one, renovation rate of around 12 million sqm (the equivalent of 150,000 dwellings, 3.4% of the total floor area) per year.

Source: Employment Impacts of a Large-Scale Deep Building Energy Retrofit Programme in Hungary. Center for Climate Change and Sustainable Energy Policy (3CSEP) and European Climate Foundation, 2010

Sustainable mobility

Transport is an essential component of the European economy. The transport industry at large accounts for about 7 % of GDP and for over 5 % of total employment in the EU; of which 4.4 % corresponds to transport services and the rest to transport equipment manufacturing, while 8.9 million jobs correspond to transport services and 3 million to transport equipment. The sector generates approximately 21 per cent of Europe's GHG emissions. Road transport is the largest contributor to these sector emissions with 93% of the total.

With this level of social, economic and environmental importance, the transport sector has a new opportunity to reframe its role with respect to society, health and environment.

Transport is considered "green" when it supports environmental sustainability, i.e. protection of the global climate, ecosystems, public health and natural resources (UNEP, 2011). In the context of the Transport, Health and Environment Pan-European Programme, "green and healthy transport jobs" are defined as jobs that form part of a wider solution to climate change, helping to facilitate the necessary reduction in emissions whilst promoting goals of broader environmental improvement, health, well-being and equity. Green transport should also support the other two pillars of sustainability, i.e. economic and social, by reducing not only greenhouse gas emissions, air pollution, noise and space consumption, but also to reduce poverty and support economic development and social cohesion.

In addition and in order to improve the sustainability of the sector, significant changes need to be made to avoid or reduce trips. Measures include the integration of land use and transportation planning, and production and consumption; shifting to more environmentally efficient modes such as public transport, non-motorized transport and to rail and water transport (for freight).

New policies will be needed for a fundamental shift in investment patterns, including land-use planning to promote compact or mass transit corridor-based cities and conservation-based transportation infrastructure, regulation of, for example, fuel and vehicle standards, and the provision of information and awareness raising (e.g. on the health and safety benefits of active travel such as cycling and walking) to promote behavioural change in the form of modal choice; a shift in financing priorities towards public and non motorized transport, coupled with strong economic incentives (via taxes and charges) to promote sustainable consumption patterns and behaviour and to ensure green modes are commercially feasible and economically attractive; and development and application of green transport technology. There are also opportunities to create green jobs in the automotive sector. In fact, the current auto industry crisis presents a unique opportunity to "green" this sector and improve fuels and vehicles through the introduction of cleaner more efficient fuels and vehicles.

Employment impact of sustainable transport

An investment to increase sustainable transport would increase employment associated with the design, manufacture and installation of transport infrastructure. This includes, for example, jobs associated with the construction of railroads, building cycle paths and the manufacture of rail rolling stock and buses. Increasing the amount of sustainable transport infrastructure would increase demand for raw materials (metals, minerals), energy and distribution services. Supplying these materials would also generate employment. (GHK, 2011)

The transition for a green transport sector will impact the labour market by creating new green jobs and greening the existing ones:

Labour impacts in the transport sector	Example of labour impact

Creation of additional jobs in new or expanding areas	For example, bicycle infrastructure and electric bicycle production, urban space design and mobility management
Adaptation of jobs to make them greener	For example, electricians or plumbers travelling to work by cargo bicycle rather than by car, and driving instructors teaching about more energy efficient driving techniques
Substitution of jobs	For example, a shift from road to rail freight would lead to job loss in the former area but job gain in the latter area
Elimination of jobs	For example, some jobs currently existing in the automobile industry

Source: Green and healthy jobs in transport: launching a new Partnership under THE PEP, WHO 2011

The design, manufacture and supply of transport infrastructure have a long and complicated supply chain. The proportion of the supply chain that exists in Europe determines the employment effect of an investment. For example, if the majority of parts for rail rolling stock are manufactured outside of Europe then the majority of employment associated with an investment may also occur outside Europe. In this case, the employment effect in Europe could be mostly associated with the assembly of the parts, rather than their manufacture. (WHO, 2011)

Green Jobs in Sustainable Transport

Supporting Active Travel	**Improving Public Transport and increase attractiveness**	**Technological Measures to Reduce Emissions per Mode**
Bicycle retail and maintenance, (high-quality) bicycle production, construction and maintenance of high quality infrastructure and environments for walking and cycling, provision of clothing, accessories, facilities for walkers and cyclists.	Construction and maintenance of public transport vehicles and infrastructure, operating public transport systems, bike hire schemes, developing and maintaining integrated travel networks, development of “bike and ride” systems.	Production and development of technologies for electric and other lower-carbon vehicles, production or renewable energy.
Encouraging Behavior Change	**Mobility Management**	**Freight**
Installation of lighting, neighborhood patrols and street maintenance, mobility advisors and behavior change practitioners, cycle training, public transport route planning, training in more energy efficient driving techniques, and environmental skills training	Establishing mobility centers, promoting customers friendly intermodal mobility systems, promoting innovation in mobility services and transport technologies, innovations in the transport chain, awareness raising, training and education.	Production, maintenance and operation of cargo bikes and electrically assisted cycles, logistics and planning to focus more on the environmental aspect.
Reducing Car Use	**Reducing Travel Demand**	**Tourism**
Implementing pedestrianization, parking enforcement, the operation of road pricing schemes, mobility management.	Information and Communications Technologies industries, local and decentralized businesses.	Provision, maintenance of bicycle hire schemes, route planning for walking, cycling and public transport, local small retailers, local providers of accommodation, community regeneration and heritage development and maintenance schemes, development of locally produced food.

Source: Green and healthy jobs in transport: launching a new Partnership under THE PEP, WHO 2011

Following the initial investment, there would also be employment associated with the operation and maintenance of the transport infrastructure; train and bus drivers to operate the vehicles, crew,

ticket agents, mechanics to keep the vehicles running, and administrative staff. Furthermore, the sustainable transport could work as driver for greening tourism. (GHK, 2011)

Overall employment effect of green jobs in green transport

A study by the United Nations Environment Programme shows that sustainable, low carbon, transport initiatives that reallocate just 0.34 per cent of global GDP in support of public transport infrastructure and efficiency improvements to road vehicles have the potential to cut the volume of road vehicles required to support equal economic activity by about a third, diminish the use of fossil fuel by up to a third, and boost transport sector employment by 10 percent. The potential employment effect of investing €1 billion in sustainable transport in Europe is 21,500 full time jobs: 16,700 jobs associated with constructing new infrastructure and manufacturing new transport vehicles/equipment, the supply of materials for the construction of sustainable transport infrastructures and the manufacture of transport vehicles equipment; and 4,800 jobs created by increases in household spending by those employed in direct and indirect jobs. (UNEP, 2011)

Even though a sustainable transport policy may ultimately lead to fewer jobs in car manufacturing and related fields such as vehicle retailing and repair services, it offers more jobs in manufacturing of buses, light rail, subways, and railways; in the provision of the required infrastructure for these modes of transport (including tracks, signals, stations, etc.); and in planning, running, and maintaining transport systems (bus drivers, conductors, and other operators; route planners, maintenance staff, etc.) (EU Parliament, 2010).

Local jobs, low infrastructure requirements: One of the main characteristics of this kind of employment is that many jobs are local, providing greater empowerment to the communities and producing benefit to the local economy, which will be particularly important for areas of high unemployment. Another feature is that jobs, i.e. in walking and cycling for transportation in urban areas, usually do not require large-scale investment programmes compared to highways, underground systems or similar, but are very scalable at the local level. A US study found that investment in public transportation spurred 70 percent more jobs per unit of investment than building new roads and spending on road and bridge maintenance creates 16% more jobs per unit of investment than new road and bridge construction (Smart Growth America. Recent Lessons from the Stimulus: Transportation, 2011).

Green Jobs in sustainable transport in UK, Austria and Spain

In the United Kingdom, the sustainable transport industry provides over 456,386 total jobs (280,244 direct jobs and 176,142 jobs associated to supply chain). The bus/coach sector employs 256,387 jobs, train sector 173,700 jobs, cycling 23,000 and light rail around 3,284 jobs. (EKOGEN, 2010)

In Austria, the Action Programme for Mobility Management “klima:aktiv mobil” is an important part of the Austrian “Master Plan for Green Jobs” presented by the Ministry of Agriculture, Forestry, Environment to promote sustainable mobility through environment-friendly vehicles, alternative fuels, energy efficient mobility management, eco-driving, cycling and public transport while stimulating green jobs.

After five years it already supports over 1,800 businesses, communities, cities and regions achieving 450,000 tons of CO2 reduction per year. Small- and medium-sized enterprises particularly benefit from this. Since 2007 the programme has given financial support of €42.5 million for projects to reduce GHG emissions in transport. This stimulated a total investment sum of €271 million and created and saved about 3,000 green jobs. The plan expects that around 15,000 green jobs will be created by expanding public transport, electric mobility and cycling. The Initiative also offers training and certification of driving teachers as eco-driving trainers and bicycle technicians for e-bike technology.

In Spain, the sector of sustainable transport employed 297,109 workers in 2008. The activities included covered (if referring to 2008) primarily public transport jobs, including taxis and car rentals, included (if 2008) jobs in the bus manufacturing industry, car-sharing, bicycle (manufacture,

marketing, public and private services), jobs of civil servants required for the regulation of mobility and take into account indirect jobs. For instance, indirect jobs in the public transport sector cover areas like security, cleaning services, hospitality, ticket sales, etc. have a special importance for the sector, and are usually subcontracted activities. (Ferri, 2011)

Total jobs in a business as usual scenario would be 307,114 by 2020, a slight increase of 3% compared to 2008. However, job estimates for the energy efficiency scenario are 429,370 jobs, an outstanding 45% increase compared to the conditions in 2008. The energy efficiency scenario not only maintains 2008 global mobility values in Spain, it also manages to reduce energy consumption in the transport sector by 13%. (Ferri, 2011)

Subsectors of green transport

Vehicles manufacturers and low carbon technologies:

About 7.5 percent of vehicles sold by members of the European Automobile Manufacturers Association (ACEA) met a stricter EU standard of 120 g CO_2/km[15]. Assuming that the portion of sales that is represented by fuel efficient cars can be applied to the industry's workforce, some 150,000 auto industry jobs could be considered a shade of green under the stricter standard. Besides technologies that improve the fuel efficiency of conventional combustion engines, hybrid-electric vehicles (HEVs) and plug-in electric vehicles (PHEVs) are generally seen as a key means to achieve higher fuel efficiency. There are calls in all industrialized countries for moving toward PHEVs. The EU, for instance, has called for 1 million such vehicles by 2020. The European Commission has proposed a €5 billion "green cars initiative" to be funded by the Commission, member states, the European Investment Bank (EIB), and private industry. In Germany, the government is aiming to put 1 million electric and plug-in hybrid electric vehicles on Germany's roads by 2020, and at least 5 million by 2030 (WWF, 2009).

Public transport

For the EU 25, the International Association of Public Transport (UITP) estimates that around 900,000 people are employed in urban public transport. The number of direct jobs in public transport amounts to about 1–2 percent of total employment. Public transport investments in Europe have an average job multiplier effect of 2 to 2.5. Studies in Europe and the United States show that about 30 jobs are created for each €1 million invested in public transport infrastructure, and 57 jobs for the same level of investment on the transport operations side. There are also employment opportunities in retrofitting buses to reduce air pollution.

Public transport employment in France, Belgium, London (UK)

Urban transport agencies are major employers. In Paris, RATP (Régie Autonome des Transports Parisiens de France) employs 43,600 people. STIB (Société Transport Intercommunaux de Bruxelles) in Brussels has more than 6,000 employees. (WWF, 2009)

In London, public transport accounts for 90% of travel into central area during the morning peak. London's extensive public transport system supports 43,600 jobs in bus and coach operation and 3,300 jobs in rail. Many of these jobs are as drivers or operatives, while others are professional, managerial and clerical roles. In addition to these, jobs directly linked to public transport are transport planners, community transport workers and rail engineering staff.

Source: WWF 2009

[15] More information about the European Union Automotive Fuel Economy Policy can be seen here: http://www.unep.org/transport/gfei/autotool/case_studies/europe/EU%20CASE%20STUDY.pdf

Car-sharing[16]

At the beginning of 2009, car-sharing services existed to a greater or lesser degree in 14 European countries. There were approximately 380,000 car-sharing users in Europe (37,000 in Germany; 84,500 in Switzerland; 64,679 in Great Britain; 27,000 in Netherlands), to whom approximately 11,900 car-sharing vehicles were available. The level achieved varies in European countries. (BCS, 2010)

Railway

Railway transport accounted for just 11 percent of total 900,000 green jobs in public transport in Europe in 2007 (International Association of Public Transit (UITP), 2007). Despite its importance for building a green economy, railway employment is decreasing in Europe while job insecurity and outsourcing of activities is increasing. Rail employment has fallen in the last few decades; in just the short span of time between 2000 and 2004, the number of jobs was cut by 14 percent even as value-added grew 3 percent. Existing estimates indicate that every 100 direct rail jobs support 140 indirect jobs, whereas 100 direct motor industry jobs only support 48 other jobs. The manufacture of railway and tramway locomotives and rolling stock in the EU-25 employed just 140,000 people in 2003, or half a percent of all industrial employment (UNEP, 2008).

Bicycles

Urban policies that promote bicycle use to replace car trips in short-distance help reducing carbon emissions and can create extra jobs. There are enormous differences among European cities, with places like Amsterdam or Copenhagen being far more bicycle-friendly than others thus associated local employment varies tremendously. Within Europe there is substantial variation of bicycles manufacturing. Italy, the Netherlands, and Germany are major centres of bicycle manufacturing. In Germany, there are estimated to be around 4,000 jobs in bicycles, parts, and components manufacturing and five times more jobs in bicycle retail and repairing than in manufacturing: approximately 22,000. (WHO, 2011) Creating and maintaining infrastructure for pedestrians and cyclists has the potential to support significant employment, creating local and physically active jobs.

Policies and skills needed for the green transition in the transport sector

Green jobs and the greening of conventional jobs in the transport sector will require new skills. For instance, previous experience of large-scale demonstration of electric vehicles has highlighted a major problem of skills shortages, throughout the value chain of research, design and development, production, distribution, sales, maintenance and repairing, disposal, and emergency first response.

In terms of anticipating and managing restructuring, the skills and qualification levels needed for electric vehicles and hydrogen fuel cell vehicles, electric power train, batteries and control systems will be essential.

The use of alternative energy in maritime transport where emerging new propulsion technology such as the use of gas-fuelled ships or wind energy propulsion will require safety standards and new skills which could be of benefit to the revalorisation of the European workforce. The use of wind energy in maritime transport is still at the research stage and will require new skills also, but in a longer timeframe.

[16] Car-sharing is a model of car rental where people rent cars for short periods of time. It is designed to be convenient for people who make only occasional use of a vehicle (a few hours) and only pay for their usage (you are billed based on how long you have a car and the distance travelled), as well as others who would like occasional access to a vehicle of a different type than they use day-to-day.

There is an increasing technological complexity in railways (e.g. in the case of high-speed trains), shipping and civil engineering as well as in aviation. Workers employed here, need also to be well acquainted with information technology, and in particular with Intelligent Transport Systems.

The development of a knowledge-intensive transport sector, highly efficient and adapted to the needs of customers, involves demanding central service requirements. Central tasks such as regulation, monitoring, modelling, statistic collection, or, at a more microeconomic level, network management, managing tolls and internalisation systems require highly skilled jobs to ensure rationality, feedback and resilience of the transport system. Logistic activities will grow over the coming years.

Gender dimension of mobility

Employment in the transportation sector is extremely gender segregated with offering up to 90% of employment opportunities to male workers (WISE 2011). Mobility and urbanity planning and decision making is male dominated.

The use of collective transport is female dominated: 60% of public transport users in Europe are female (University of Copenhagen 2007). While men use cars to go to work and for leisure purposes, women use much more often public transport to go to work, using the car for accompanied trips to bring and pick up family members and to fulfil care economy tasks.

The majority of the European population does not have a car at its disposal and the group of car owners is male dominated (Greens/EFA Group, undated). In Europe more than 70% of all car owners are male, in Germany about 2/3 of all car owners are men. In general women are the group with the highest potential to contribute to a higher share of car use in the future. Female car buyers traditionally prefer low consumption engines and environmentally friendly cars. However, nowadays they are orienting towards bigger and faster cars and they are “catching up” in obtaining drivers licenses and owning cars.

Organic farming

Social impact and employment effects of organic agriculture

Organic farming initiatives can have a catalyzing effect on innovation in rural development. It can contribute to the quality of life in rural areas as well as to diversification, the strengthening of regional identities, to landscapes and the local cultural heritage, and it can foster links to rural tourism. As a consequence, in some countries organic farming has become a focus of regional and rural development programmes.

The impact on employment results from fundamental differences between organic and non-organic farming systems. Non-organic farming provides fewer jobs because it replaced skilled labour with agrochemicals and larger machinery; increased farm size to spread machines and labour over a larger area; and introduced specialised and simplified farming systems. The main elements of organic farming which contribute to higher employment include: small, more diverse farms with mixed systems (crops and livestock); varied crop rotations; careful soil management; maintaining the positive health of plants and animals; rearing farm animals outdoors to high welfare standards; and maintaining habitats for natural predators and other wildlife, all these activities are more labour intensive than the ones of the intensive agriculture. (House of Common, Environment, Food and Rural Affairs Committee, 2008)

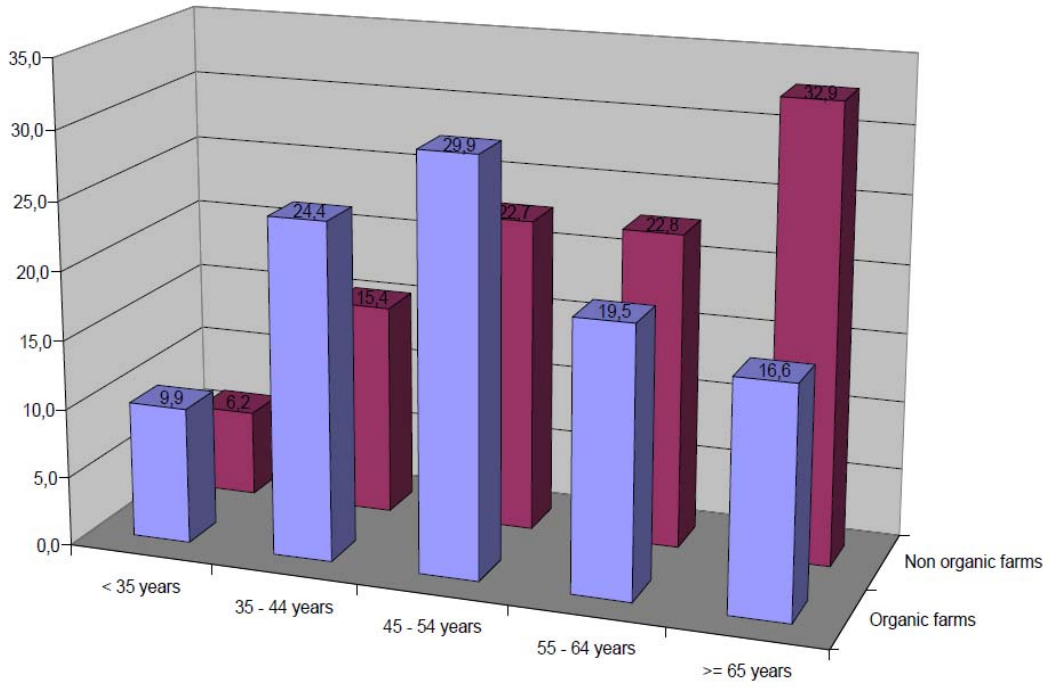
The direct, indirect and induced employment effects of €1 billion investment into measures to conserve wildlife, maintain and enhance landscape quality and character, protect natural resources, protect the historic environment and promote public access and understanding of the countryside is 6,600 full time jobs. (GHK, 2011)

Various attempts have been made to quantify the employment dividend of organic farming in Europe. One review of over 40 European studies found that, on average, organic farms provided 10 to 20% more jobs per hectare. This effect is often found to be associated with high value enterprises (e.g. horticulture) and/or on-farm retailing/ processing. (Vision for an organic food and farming. Agenda 2025, 2008). Organic Works, a 2006 survey from the UK's Soil Association, found organic farming in the UK provides 32% more jobs per farm than equivalent non-organic farms, while organic farmers in the UK were on average seven years younger than non-organic farmers. In France, the number of organic farmers and organic companies has increased by 14 % to 35,271 in 2011. Compared with 2010, the market for organic food grew by 11 % to nearly 4 billion Euros. (French Agence Bio, 2012)

Occupational health may be improved due to reduced exposure to agricultural chemicals, but on the other hand there are more significant effects of manual labour. Overall, organic farmers are younger, more educated, have a broader range of skills and engage in knowledge transfer activities. More women are engaged in organic farming and organic food production. Returns to labour on organic farms are similar or higher. (Technology Platform Organics, 2008)

Age distributions of the managers of farms with organic area and farms without organic area are strikingly different: farmers younger than 55 represent 64.3% of the organic sector whereas they represent only 44.3% of the conventional sector. (EU Commission, 2010)

Graph 15. *Comparison of age distribution of farm managers in the organic and non organic sector in the EU-27 in 2007 (percent)*



Source: Farm Structure Survey

Source: An analysis of the EU organic sector, EU Commission, 2010

The combination of similar or higher incomes and employment contributes to rural economic development, and this may be strengthened by added value activities such as direct marketing, processing and tourism, particularly if linked to organic food production. Higher farm incomes and a positive farm development perspective can result in strengthening the role of agriculture in rural development. (Technology Platform Organics, 2008)

National Survey of Employment on Organic Farms in the UK

To assess the wider economic and social benefits of organic farming, particularly employment, the Soil Association commissioned the first national survey of employment on organic farms in the UK. The main findings of this research of 2006 and other studies revealed the following:

- In general, organic farming provides 32% more jobs than non-organic farming in the UK. On average, organic farms provide 2.77 full-time equivalent (FTE) jobs per farm, compared to 2.09 FTE on commercial non-organic farms.
- Farms currently in organic production, although they include proportionally more extensive grassland farms, provide almost 50% more jobs per farm and over 30% more jobs per hectare than non-organic farms.
- Most jobs on organic farms are full-time. Casual labour accounted only for 2.6% of FTE jobs on organic farms.
- The University of Essex research found that the majority (81%) of the total employment on organic farms was generated by the farming system itself. Of the average 3.08 jobs per organic farm, 2.50 are accounted for by agricultural employment with the remaining 0.57 (19%) being jobs in on-farm processing and direct marketing
- Organic farms in the UK were three times more likely to be involved in marketing that shows they were engaged in business innovation activities like processing or direct marketing, building on the trust and connection between farmers and consumers of organic food. Farms with these enterprises provided 64% more jobs than farms without them.
- In contrast to the trend on non-organic farms, small organic farms can be productive and provide jobs. The smallest organic farms employ 70% more people than the average organic farm and are, on average, 36 hectares growing vegetables, soft fruit or orchards.
- Organic farming currently represents 4% of farmland in the UK. If all UK farming converted to organic production, this would create an estimated 93,000 more on-farm jobs.
- Importantly, organic farming is attracting younger people into agriculture compared to UK farming as a whole. On average, organic farmers are seven years younger than their non-organic counterparts.
- Organic farming is encouraging more new entrants into agriculture: 31% of organic farmers had chosen agriculture as an entirely new career, cf. 21%.
- Organic farmers tend to be more optimistic about the future: 64% of organic farmers expect their family to take on the farm cf. 51% non-organic farmers; and a greater proportion of organic farmers (39%) were happy to stay in farming, compared to 26% of non-organic farmers.

Source: Organic works. Providing more jobs through organic farming and local food supply. UK Soil Association, 2006.

Waste management and recycling

Waste management is considered a “green” sector given its goals focused on the reduction of environmental impact associated with waste treatment. Recycling ensures that resources remain in the economy via a closed-loop process. It contributes to a shift to a circular economy and away from a linear economy model characterised by resource depletion and waste. It also reduces virgin non-renewable resource use, directly helping decouple material use from economic growth and producing lower environmental impacts. Recycling could help ensure that the EU has secure supplies of critical resources, especially rare metals, by covering a reasonably large part of EU consumption of certain materials.

Recycling helps businesses, other organisations and communities avoid the costs associated with landfills and incinerators - both in terms of financial expenditures and environmental impacts. Finally, the consolidation of the recycling sector promotes social cohesion and employment associated to a sustainable production mode.

The situation of the waste and recycling sector

The EU27 generated 260 million tonnes of municipal waste (2008) of which 107 million tonnes (41%) were being recycled (Eurostat, 2010). A study of the composition and recycling of municipal and commercial and industrial waste streams (Prognos 2009) suggests that commercial and industrial (C&I) waste streams may account for an additional 150 million tonnes of waste. However, waste is increasingly considered a valuable resource, the disposal of which should be avoided to ensure that its value is realised. (GHK, 2011)

The recycling sector is growing and developing but it is currently dominated by seven core groups of materials: glass, paper and cardboard, plastic, iron and steel, copper, aluminium and nickel, precious metals and other metals. Turnover of these seven recyclables was €60.3 billion in 2008. While the economic value of all recyclables increased, this trend is especially notable for metals. Although the financial crisis has reduced this level, the importance of recycling for the economy was still greater in 2009 than five years earlier. (EEA, 2011)

The importance of recycling has been reiterated in a number of EU documents in recent years. For example, the European Commission's Action Plan on Sustainable Production and Consumption and Sustainable Industry states the need to reduce dependence on raw materials and encourage optimal resource use and recycling. The Commission's 2008 Communication on the Raw Material Initiative likewise highlights recycling as an important measure to enhance sustainable supply of raw materials.

Most recently, the European Council has underlined the need to focus on 'steering the market towards recycling and waste reduction and recycling certificates'. Furthermore, many European countries have placed recycling at the heart of their policies to increase resource efficiency. (EEA, 2011)

Recycling and job creation

The employment opportunities in the recycling sector include low-skilled work in particular, but also include medium- and high-skilled jobs, ranging from collection, materials handling and processing to manufacturing products. (EEA, 2011)

Examples of green jobs in waste management and recycling sector are described in the table below.

Activities related to recycling, reuse and remanufacturing of municipal, commercial and construction wastes

Green jobs related to recycling, reuse and remanufacturing waste	
Collectors	Organizations which pick up or transfer materials through herbside, bright, bulky collection and/or commercial onsite collection of recyclable material. Include private, local authority and third sector organizations.
Brokers	Business that purchase recyclable commodities (other than end users or processors) for resale. Both collectors and processors may use brokers to sell recyclable materials to end users.
Processors	Business that bale, crush, pelletize, compost, demanufacture or otherwise change the form of the recyclable material for sale to an intermediate market or end manufacturer, including materials recovery facilities, scrap metal dealers, etc.
End Users	Businesses that use recycle materials as feedstock in the production of a new product. This includes paper, steel and aluminum mills etc, but not companies which generate recyclable materials internally and reuse these materials.
Re-manufacturers or reusers	Businesses that remanufacture or reuse recyclable materials such as: furniture, white goods, computers and electronic appliances; used motor vehicle parts, tires, wood (e.g. pallet rebuilders). This category also includes retailers that sell used merchandise (e.g. charity shops).
Recycling equipment manufacturers	Businesses that manufacture equipment used solely for the purpose of collection and/or processing of recyclable materials for recovery and reuse.

Source: “More jobs, less waste. Potential for job creation through higher rates of recycling in the UK and EU”. Friends of the Earth. September 2010.

A growing body of evidence indicates that the recycling industry generates more jobs at higher income levels than landfilling or incinerating waste. Recycling has roughly twice the economic impact of burying the same amount of materials in the ground. Specifically, recycling a tonne of waste will pay USD 101 more in salaries and wages than disposing of it in a landfill (CIWMB, 2003). Recycling 10,000 tonnes of waste needs up to 250 jobs compared with 20 to 40 jobs needed if the waste is incinerated and about 10 for landfill. (EC, 2005)

In terms of employment impacts of implementing a recycling facility, there are new jobs created on site during construction of new infrastructure of the recycling plant, most of the investment will be associated with the purchase of the goods and services required to construct the plant. Once the plant is running, labour costs compose a significant proportion of total costs. Collecting and sorting waste are labour intensive and account for many of the jobs associated with recycling. As well as unskilled work manually sorting waste, there may also be skilled professional work operating recycling plant and equipment. In addition, there are also administration and support jobs. (GHK, 2011)

The current employment in the waste management and recycling sector represented around 2 million jobs in 2008 in the European Union. Providing an exact figure is complex Eurostat employment data are not structured with a focus on recycling. Data on some relevant activities (e.g. collecting recyclable materials, and activities enabling the use of recyclables in manufacturing) are aggregated with other activities.

Moreover, given the very different recycling practices across the EU27 in terms of labour intensity, investment in automated sorting equipment and the sophistication of materials recovery, separation, and processing and the different combinations of local authorities, private companies, community and third sector organisations involved, there is no reported data on employment trends in the sector and no single tally for the number of jobs in recycling, reuse and remanufacturing. (FoE, 2010)

Overall employment related to materials recovery in Europe has increased steadily, from 422 workers per million of population in 2000 to 611 in 2007, which is an increase of 45 %. These figures are conservative, as they do not include employment linked to processing materials at certain manufacturing facilities, such as the manufacturing of pulp or metals. (EEA, 2011)

Green jobs in waste management and recycling in Europe. Some figures from UK, Spain and Germany

United Kingdom

The UK generated 33.4 million tonnes of municipal waste in 2008, of which 12.2 million tonnes (36.8%) was recycled with about 118,000 jobs created in waste management businesses (including collection, recycling and sale for reuse of recyclable materials). 91,000 of them were in waste treatment, collection and disposal. (FoE, 2011)

The Local Economy Policy Unit (LEPU) calculated, in their research on the up- and downstream employment impacts of recycling in London that for every 1,000 tonnes recycled per year, 6 jobs would be gained across the entire waste stream (LEPU, 2004).

For the United Kingdom, if an ambitious but achievable recycling target of 70% for municipal waste was set and achieved by 2025, then conservative estimates suggest that across the UK this could create 29,400 new direct jobs in recycling, 14,700 indirect jobs in supply chains and 7,300 induced jobs in the wider economy relative to 2006.

Projections for achieving similar rates of recycling for commercial and industrial suggest that achieving the 70% target could lead to at least an additional 18,800 total new C&I recycling related jobs - on top of municipal recycling related jobs – of which 10,800 would be direct, 5,400 indirect and 2,700 induced.

Spain

In Spain, a study conducted by ISTAS (Instituto Sindical de Trabajo Ambiente y Salud) shows that the implementation and development of manual and automatic deposit-refund systems for retail stores increases the quality and quantity of recovered material and the value of containers. It also promotes the creation of new jobs in all the phases of the waste disposal cycle. ISTAS studies show that the implementation and development of such systems would create 13,600 new direct and indirect jobs in Spain during the first stage of development, due to the positive drag effect on related sectors as transport, logistics, construction and recycling. This national analysis only covers the implementation phase of a Deposit and Return Systems in Spain. The implementation of this system for single use containers will obviously be the first step in the reintroduction of reusable containers. Glass or PET containers would be first candidates for reuse. (Pérez, 2011)

Germany

The assessment of job data in the reusable containers sector in Germany shows that the implementation of high rates of reusable beverage containers (84% of beer containers and around 30% of soda and bottled water containers are reused) implies a significant generation of secure jobs along the production chain; for each job in the single use containers sector there are 5 jobs in the reusable containers sector.

A study carried out by GHK in 2011 found that there were some 10,000 indirect jobs associated with a capital expenditure of €1billion located in the supply chain, the direct employment per 1000 tones associated with a 70% recycling rate and with a €1 billion investment would directly support some 12,200 full time jobs, and a total of 21,300 full time jobs. (GHK, 2011)

Growth in employment in the waste management sector in the EU15 fell by about 0.7% per annum between 1999 and 2004 but employment in recycled materials grew rapidly at a rate of up to 7% a year over the same period.

According to the same study, the Flanders region of Belgium has one of the highest recycling rates in Europe – more than 70%. In 2002 the growth in Flemish waste production stopped, even though the economy and population grew, and from 2006 no more Flemish municipal solid waste has been sent to landfill. In Flanders there is a ban on landfilling both recyclable and combustible municipal waste. This has helped Flanders move away from landfilling and to achieve these high rates of

recycling. The main goal that drives waste policy in Flanders is that inhabitants should not produce more than 150 kg of residual waste per inhabitant per year.

New jobs potential in recycling by 2020

If waste management and recycling industries in the EU represented around 2 million jobs in 2008, full compliance with EU waste policy, 50% for recycling, could create an additional 400,000 jobs according to the European Commission. If a target of 70% for recycling of key materials was met on a European level, conservative estimates suggest that the total potential across the EU27 is more than 563,000 net new jobs. 322,000 direct jobs could be created in recycling an additional 115 million tonnes of glass, paper, plastic, ferrous and non ferrous metals, wood, textiles and biowaste. These jobs would have knock-on effects in down and upstream sectors and the wider economy and could create 160,900 new indirect jobs and 80,400 induced jobs. (FoE, 2010).

EU 27 potential new direct, indirect, induced and displaced jobs as a result of 70% recycling rate by 2020

Key recyclable material	Extra recycling of key materials each year by 2020 (000 tones, relative to 2004)	Potential new jobs associated with recycling			
		Direct	Indirect Multiplier:1.5	Induced Multiplier: 1.75	Total Net New Jobs
Glass	4,882	23,763	11,882	5,941	41,586
Paper	13,202	23,763	11,882	5,941	41,586
Plastic	9,955	92,582	46,291	23,145	162,018
Iron and Steel	17,838	96,326	48,163	24,081	168,570
Aluminum	1,270	13,973	6,987	3,493	24,453
Wood	28,471	21,353	10,677	5,338	37,368
Textiles	5,231	26,154	13,077	6,538	45,769
Biowaste	33,779	43,913	21,956	10,978	76,847
Total	114,628	321,725	160,862	80,431	563,019

Source: Estimates based on 2004 Baseline (Prognos et al, 2008)

Nonetheless, the EU has expanded paper and plastics recycling through growth in export, particularly to China. While past employment studies have focused on domestic jobs, future expansion of recycling which partially relies on exporting could create overseas jobs at the expense of EU based employment opportunities. It follows therefore that the more opportunities are made for 'closed loop' recycling within the EU, the fewer jobs are likely to migrate to other countries. (FoE, 2010)

BIODIVERSITY

Links between biodiversity and employment

The report "The Social Dimension of Biodiversity Policy" shows that the relationships between biodiversity, ecosystem services and employment are significant and closely intertwined. Jobs are linked to biodiversity directly through management and conservation of protected areas, and through the direct provisioning services of ecosystems (supporting primary industries such as fisheries, forestry and agriculture) and indirectly through the provision of valuable ecosystem services such as nutrient cycling and water provision.

The numbers of jobs provided directly and indirectly by biodiversity and ecosystem services is significant in the EU. Primary industries (agriculture, forestry, fishing, water supply) are highly dependent on biodiversity and related ecosystem services. As a consequence, it is expected that those economies whose populations are largely composed of fishermen, farmers, and rural societies will be most exposed to the impacts of changes in biodiversity.

Ecosystems, economy and employment (Sustainlabour 2012) present the following conclusions:

- Today's jobs, biodiversity and ecosystems form the basis of a significant part of the economy and a large part of existing jobs therefore directly depend on their state of health.
- It is estimated that in the European Union 14.6 million jobs, in other words 7% of the labour market, are directly related to biodiversity. In the case of developing countries, this figure rises to around 927 million, in other words 35% of their labour market.
- As far as jobs related to ecosystem services are concerned these figures are even higher, with 55% of jobs in the European Union and 84% of jobs in developing countries being closely related to these services.
- Future's jobs: An appropriate environmental management which protects biodiversity and ecosystems is an important source of the creation of new green employment.
- Farming is a clear example: organic farming production creates a third more employment than non-organic farming practices.
- In the case of the forestry sector it is calculated that as many as 10 million new jobs could be created as a result of sustainable forest management.
- Fishing: 100,000 new jobs would be created in Europe alone if 43 of the 150 European fish populations were renewed. This would mean a 28% increase in the total number of jobs in the European Union.
- Attention must also be paid to employment quality. Biodiversity-friendly production is usually responsible for better working conditions. A prerequisite for the success of policies, programmes and measures for the conservation of natural biodiversity and ecosystems is social and gender equality.

In the EU, employment related to biodiversity often provides new and skilled employment opportunities for a population increasingly disconnected from the land. In developing economies, however, much of the employment linked to biodiversity is in poor quality, low paid subsistence jobs in the primary industries.

Nevertheless, more sustainable farming and forestry practices offer potential both to maintain biodiversity and to enhance employment by supporting safer, more lasting jobs linked to local livelihoods rather than centralised systems of production. Nature conservation and ecotourism also offer opportunities for skilled, knowledge-based and sometimes relatively well paid employment, often helping to diversify local economies and the employment opportunities they provide. (FEEM, 2011)

Natura 2000 Network

The Natura 2000 Network (N2K) is an EU-wide network of nature protection areas established in response to the continual large scale destruction and fragmentation of wildlife habitats in Europe. It was established under the 1992 Habitats Directive, and includes areas designated under the 1979 Birds Directive, and fulfils the EU's obligation under the UN Convention on Biological Diversity. The objective of the network is to ensure the sustainability of Europe's most valuable and threatened species and habitats. It plays a key role in protecting the EU's biodiversity, and in helping to meet its commitment to halt the loss of biodiversity and ecosystem services in the EU by 2020.

Various studies have documented the benefits of investing in the N2K network, underlining the wide range of ecosystem services that are provided by the network such as tourism and recreation, water quality, flood control, and wider cultural services. The Natura 2000 network safeguards species and habitats and helps to provide essential environmental services for people and the economy. N2K sites can help to attract financing and offer an important source of direct and indirect employment by diversifying rural employment opportunities and encouraging skills retention and development.

The types of activities associated with the management of N2K sites involve general management activities (e.g. preparation of management plans, the coordination of restoration activities, communication activities, etc.), as well as the monitoring and restoration activities themselves. These activities sustain a number of ancillary activities such as contractors supplying materials or labour in order to restore or develop the necessary infrastructure and habitat restoration works, installations for public access, the processing/distribution/marketing of natural produce, souvenir shops, tourism and so forth.

Some of these activities are on-going (e.g. site management), others are one-off (e.g. restoration works, public access works), whilst others are recurrent (e.g. monitoring / surveillance).

Investment in the Natura 2000 network creates jobs in the management of the network, among supplier businesses (particularly rural land management contractors), and in sectors that benefit from sites, such as tourism.

The employment resulting from an investment of €1 billion in the Natura 2000 network is around 29,900 total jobs (FTE); of which 17,900 are direct jobs; 2,800 are indirect jobs associated to the supply of goods and services related to the management; and 9,300 induced jobs created from the consumption activity generated by spending of the wages received those directly and indirectly employed.

Source: GHK, 2011

Forestry

The EU has a total forest area of approximately 177 million ha (around 40% of the EU territory), of which 130 million ha are available for wood supply and the production of non-wood goods and services (cork, resins, berries, mushroom, hunting for example). The forest-based industries are a very important EU economic sector (woodworking industries, pulp and paper, printing industries), with a production value of €365 billion, and an added value of around €120 billion created by more than 3 million jobs.

As acknowledged in the report "State of Forests in Europe 2011" by the Economic Commission for Europe (UNECE), the main challenges faced by workers in Europe are the high average age of workers, rate of accidents too high and the low number of improvements that the industry has carried out in the last decade.

Sustainable fisheries and aquaculture

By 2007, the total number of full time jobs in the EU fisheries sector (including catching, aquaculture, processing and ancillary services to the other segments) was close to 355,000, 0.2% of total EU employment. The catching segment accounted for close to 145,000 (46%), processing for 137,000 (34%) and aquaculture for 55,000 jobs (16%). Ancillary services accounted for the remaining 4% (18,000). Quality of employment, in terms of wages and safety, will remain low. In some Member States (e.g. Greece, 1.5%), or regions (e.g. Galicia, Spain, 3%), or coastal communities (e.g. Killybegs, Ireland, 68%) the sector is an important source of jobs. (EU Commission, undated)

Employment trends are negative, in line with the evolution of most primary sectors in the EU - since 2002 the employment declined by 31% in the catching segment and by 16% in aquaculture.

The economic and social viability of fisheries can only result from restoring the productivity of fish stocks. It is then necessary to rebuild European fisheries resources by maximizing their sustainable yield as targeted in the latest reform of the Common Fisheries Policy. A comprehensive research effort should also target innovative solutions for the "greening" of the fisheries sector by reducing its ecological footprint on the marine ecosystems, including reducing discards and wastes and making the best use of by-catches. Fisheries rely directly on the productivity and health of aquatic ecosystems, which are under increasing pressures, including impact from other sectors and conflicting claims for the use of maritime space. (EU Commission, 2009)

III. Quality of green jobs

It should be noted that there is a lack of information regarding the quality of green jobs. There are very few reports that analyze the different quality dimensions: wages, occupational health and safety, accidents, gender, to what extent green jobs are covered by collective bargaining, etc. Green jobs in most cases are jobs in new sectors, thus they are not organized jobs at workers and employers' level, their working conditions have not been improved through decades of unionism, and their occupational health risks have not even been fully assessed.

In terms of quality of employment, the conditions vary greatly among sectors and research is scarce. In the following box a brief summary is presented of two of the studies available for different sectors.

Renewable energy sector

According to the report "Study on employment associated to the promotion of renewable energies in Spain in 2010" elaborated by ISTAS, 83,7% of staff in the renewable energy sector is on a permanent employment contract; the remaining workers are on a temporary contract (14,1%), in training (0,9%) or are self-employed (1,2%). However, the report notes that the high level of subcontracted companies working on less added value tasks might mean that their working conditions as well as their qualifications are lower. Regarding the gender dimension of green jobs in renewable energy, in Spain it should be noted that women represent 26,6% of the labour force, with 64% of them working in administrative jobs or sales, while areas directly involved in industrial production show lower percentages of women. In terms of qualification, most workers in the renewable energy sector are higher education graduates and qualified workers. Subcontracted companies render lower qualification jobs. (ISTAS, 2010).

Waste management and recycling

The research undertaken by the Work and Life Quality in New and Growing Jobs (WALQING) in Australia, Bulgaria, Denmark and Italy, shows that working conditions in the waste sector in Europe face important challenges. Patterns of liberalization vary widely: from downright outsourcing to a wide range of public private partnerships (PPP) and divisions of labour, in which the public sector as a central client still plays a significant role. In Southern and Eastern Europe especially, boundaries between the informal and illegal sector are permeable. In terms of job quality, for most non-administrative jobs in the waste sector, the working environment and conditions are problematic. Waste collection and urban sanitation (street sweeping and washing) are mainly manual activities that often imply high physical strain with low mental challenges and limited career perspectives.

Health risks, specifically muscle or back problems, are thus prevalent, and workers with health problems or disabilities are vulnerable. New health risks emerge in sorting and recycling, where workers often face unpredictable or hazardous materials and may have to work in dusty and unhygienic environments. On the other hand, since the 1990s, social partners, regulators or contract holders (especially in the public sector) in some places have been able to implement initiatives to improve working conditions such as introducing better technologies, lowering workload or working hours, or increasing skills. When waste is collected and managed by municipalities, employment security traditionally has been well above that in the private sector. In Bulgaria waste collection is almost entirely carried out by members of the Roma community. In Italy, some migrants also work in waste collection, and some tasks are outsourced to social co-operatives that integrate vulnerable groups into the labour market.

In the countries examined, the composition of the social partners and the coverage and outcomes of collective bargaining differ widely. Outside the public sector, where unions have traditionally been strong, coverage by collective agreements is patchy. Social dialogue at the EU level is not yet formalized in the waste sector. It becomes clear that the sector requires some efforts of developing

forums and modes of social dialogue, from some institution-building in the less organized countries and segments of the sector to the extension of social dialogue beyond the traditional actors and issues. (WALQING, 2012).

Green Jobs impacts on productivity and income

As previously explained there is a gap in quality issues on green jobs research, also for incomes. The research about income considerations of a lower carbon economy carried out by the International Labour Organization and the International Institute for Labour Studies in 2011; found that the top 15 emitting industries employed 12% of all workers in the EU-25 and 9.5% in the EU-15 Member States. The shares are lowest among Sweden and Denmark and are highest in Poland and Slovenia.

In the EU-15, nearly 30% of workers in the top 15 emitting industries are low skilled compared with less than 20% in the low carbon intensive sectors.

While wage shares in the high-carbon intensive sectors (HCIS) tend to be higher in comparison with the low-carbon intensive sectors (LCIS), across EU groups, wage shares in the top 15 emitting industries are systematically lower and have incurred slightly larger declines in the decade between 1995 and 2005 in comparison with both the LCIS and the HCIS.

In the EU-15, wage shares of the low-carbon intensive sector have tended to fall less than in the top 15 emitting industries, especially in recent years.

Although a number of factors are said to influence wage shares, e.g. trade liberalization, labour market institutions, prevalence of unions in the last ten years; the wage shares of low-skilled workers have tended to decline on average more than the wage share of high-skilled workers, which in some instances has risen.

Looking beyond the employment effects of greening the economy, it is also necessary to take into account the consequences on productivity and incomes.

- results differ in the short and long term: while in the short term they could be negative, they could be less negative or even positive in the longer term
- even if the effects on employment were neutral or positive (in the longer term), the effects on real income could be negative
- significant emission reduction targets are likely to result in higher energy prices, increasing production costs and resulting in negative indirect effects.

The health and safety dimension of green jobs

The green transition will require the development of a better understanding of the implications of green jobs on health and safety at the workplace. On the one hand, measures aimed at environmentally friendly workplaces can help to improve working environments, having a positive impact on workers´ safety and health. In order to shape the future of occupational safety and health in green jobs and inform EU decision makers, Member States' Governments, trade unions and employers, the European Agency for Safety and Health at work carried out research about the new and emerging risks associated with green technologies by 2020 (EU-OSHA, 2011).

The results of the study on the impacts of green jobs on health and safety jobs are summarized in the following table:

Technology (Industrial scale)	Health and Safety Aspects
Wind Energy	Physical hazards - falls from heights, manual handling, working in confined spaces (exposure to e.g. dust, musculoskeletal disorders (MSDs) due to awkward postures), physical load from climbing towers, electrocution during construction and maintenance. Offshore hazards - lifting, boats, weather, stability of platforms. Machine safety - ice throw, blade fracture. Chemical risks - exposure to resins, styrene and others during blade manufacture and maintenance.
Marine Energy	Physical hazards - falls from heights, manual handling, working in confined spaces (exposure to e.g. dust, MSDs owing to awkward postures), electrocution during construction and maintenance. Offshore hazards - lifting, boats, weather, stability of platforms. Chemical risks - exposure during manufacture and maintenance of components.
Solar Photovoltaic	Physical hazards - falls from heights, manual handling, confined spaces, electrocution during construction and maintenance. Exposure to toxic chemicals and nanomaterials during manufacture and disposal/recycling.
Concentrated Solar Power	Construction and maintenance of industrial scale installations, electrical hazards, hazards from concentrated sunlight. High temperatures in concentrating sites.
Bioenergy	Fire and explosion during production and use. Biogas quality for injection into the grid. Exposure to biological hazards. Exposure to carcinogens, heavy metals and gases during thermal processing. Asphyxiation. Risks from small scale manufacture by inexperienced people. Dock related hazards during biomass importation, e.g. oxygen depletion in confined spaces, exposure to hazardous volatile organic compounds (VOC), dusts, moulds and endotoxins. Integration of biofuels into the European refinery network.
Geothermal Energy	Emissions, (e.g. sulphur, silica), hazards from activities such as: trenching, excavation, electrical issues, welding and cutting, falls. Hazards associated with borehole drilling, piping steam/hot water, construction and operational activities. Potential for earthquake/tremor risk from drilling, pumping activities into deep rock.
Hydroelectricity	Hazards associated with construction, operation and maintenance. Electrical hazards, water hazards, moving machinery etc.
Green Chemistry	Potential for exposure to unknown hazards from new processes and materials. Substitution of chemicals for environmental reasons could result in greater risks to workers. Chemicals obtained from renewable sources can still be toxic. Potential risks at the recycling stage.
Transport Technologies	Health and safety issues associated with contributing technologies - energy sources, materials, vehicles etc. Fire and explosion from fuels, novel electrical risks from electric and hybrid vehicles during maintenance and operation. Risks to rescue-crews after accidents. Distribution and use of hydrogen etc. Recharging/battery exchange hazards
Construction Technologies	A range of hazards. In particular, the combination of known risks in new situations, e.g. installation of renewable energy equipment at heights, the installation of new technology such as feed-in to smart grids. Use of new materials and potential risks from dangerous substances used in new construction materials (e.g. when polishing, grinding nano-containing bricks/paints, etc., including in maintenance and demolishing activities. Off-site construction could reduce risks on site but transfer of risks to other groups of workers. Risk of exposure to asbestos during retrofitting activities.
Waste Management	Manual handling risks during collection and sorting. Exposure to chemical and micro-organisms during collection, sorting and processing. Fire and explosion risks from processing. New materials, when being collected as waste, may present a variety of unknown risks linked to (new) dangerous substances they may contain. Landfill mining will increase exposures to harmful materials.
Recycling Technologies	New recycling technologies may introduce new risks. New materials, when being recycled, may present a variety of unknown risks linked to (new) dangerous substances they may contain.

Source: EU-OSHA, 2011.

Gender aspects

Female jobs in green economy

The majority of green jobs are expected to be in the construction, manufacturing and engineering fields where women are significantly under-represented (see table below). As a result, the green economy may unintentionally exclude women. With regard to the secondary sector, at least 80% of global green jobs are expected to be in this sector, including construction (e.g. retrofitting buildings, transport infrastructure), manufacturing (e.g. fuel-efficient vehicles, pollution control equipment), and energy production. But in all regions of the world, the female share of employment in the secondary sector is far lower than that of men. In the construction sector worldwide, the few jobs held by women are generally administrative and secretarial. The more skilled building positions – metal workers, insulation specialists, cement masons, plumbers and pipe fitters, carpenters, electricians, heating and cooling experts– are male dominated in all countries. In the energy industry, the share of female employees is estimated at 20%, most working in non technical fields such as administration and public relations (ILO, 2007). From a global perspective, primary sectors, including agriculture and forestry, are expected to be major beneficiaries of the transition to a low-carbon economy. However, women comprise less than 20% of the global formal workforce in primary sectors and around 2% in developed countries. (Sustainlabour, 2009)

Women in Green Jobs Sectors

Sector	Components	Estimated share of female employment (2009)
Primary	Farming/fisheries/forestry	20%
	Natural resource	8%
Secondary	Manufacturing	24%
	Construction	9%
Tertiary	Engineering services	12%
	Financial and business services	15%
	Eco-tourism	20%
	Administrative services	68%

Source: Sustainlabour estimates based on ILO, 2007

Source: Sustainlabour, 2009.

There are emerging green service fields such as ecotourism which are providing greater opportunities for women, particularly in developing countries. (Sustainlabour, 2009).

The 'green economy' can be an opportunity for women to gain their rightful place in the workforce through better-paid, non-traditional jobs. A combination of traditional and innovative strategies is needed so that women as well as men can benefit from the green economy. This involves a paradigm shift to link the environmental and social consciousness of women with the wide range of jobs, including manual labour and technical positions, expected to emerge from the shift to a green economy. (Sustainlabour, 2009).

The following list of recommendations are suggested by the union movement to implement measures that recognize and promote women's economic contributions in society

- secure women's property rights, land tenure, and control over natural resources;
- promote women's access to services and technologies needed for water, energy, agricultural production, family care, household management and business enterprises;
- provide safe health care facilities, including for sexual and reproductive health;

- enable women and men to combine their jobs with childcare;
- support investments in women's economic empowerment;
- promote women's participation in government and business leadership;
- implement targeted campaigns to organise female workers in potential green sectors.

Women workers and green jobs in Europe

EU-wide statistics on green jobs and women have not yet been developed. Eurostat presents a very limited array of disaggregated data including regarding green sectors.
In most Member States the gender gap in employment rates remains substantial. This is particularly the case in Greece, Italy, and Malta where the employment rate for men is more than 20 percentage points higher than that for women. In contrast, in Finland and Sweden the employment rates for men and women differ by less than 5 percentage points, and are broadly the same in Estonia, Latvia and Lithuania. (EU Commission, 2010)

Men and women employed in environmental sectors in Sweden

In Sweden, rates of female green jobs are available. Statistics from the Swedish Government show that the presence of women is higher in the tertiary sector. The highest share rates are in education research and monitoring (54%), eco-tourism (49%), environmental consultants (41%). Regarding other sectors, the number of women employed is significant in the solar energy sector (31%). (Swedish Government, 2009).

Environmental area	Employed women	%	Employed men	%	Total
Air pollution control	315	27	831	72	1147
Wastewater management	1,195	18	5474	82	6,669
Waste management	2,684	17	13,401	83	16,085
Soil and groundwater	268	30	631	70	899
Noise and vibration	50	22	178	78	228
Environmental consultants	3,405	41	4,850	59	8,254
Education, research	2,323	54	2,017	46	4340
Recycled materials	1,611	16	8,194	84	9,805
Renewable energy, of which	3,170	22	11,232	78	14,402
Electricity/heat from biofuels	1,415	23	4,862	77	6,277
Wind power	348	21	1,289	79	1,637
Solar	227	31	515	69	742
Hydropower	411	30	955	70	1,366
Manufacturing of biofuels	209	17	1,032	83	1,241
Renewable transport fuels	117	23	394	77	511
Geothermal heat and others	443	17	2,185	83	2,628
Heat/energy saving	1,102	18	5,007	82	6,109
Sustainable. agriculture./fishery	652	25	1,921	75	2,573
Sustainable forestry	146	18	664	82	810
Other resource management	524	49	556	51	1,080
TOTAL	17,444		54,956		72,400

Source: Number of employed men and women by environmental area, 2003-2007, Swedish Government (2009b)

Skill needs for green jobs

Green restructuring generates demand for new skills as existing producers reorientate activities towards new markets and products. Generally, skills needs are reflected in demand for additional competences of existing workers. Greening occupations also raises demand for new competences. While this is especially significant in the energy sector as a result of major investment and expansion in renewables and energy management subsectors (giving rise to new occupations), the main need is to revise and upgrade the skills of existing workers. These new environmentally-driven competences relate to new technologies (such as solar thermal power or new vehicle power trains, waste management) (CEDEFOP, ILO, 2010).

Skill development priorities for the low-carbon economy

There is a lot of variety among Member States in skills programmes for green jobs due to their differing social, economical and environmental conditions. These programmes tend to be driven by employment demand and often by the implementation of environmental legislation that requires sectors to train their staff to meet new or stricter regulation. The actual content of training and programmes varies across industries and is often tailored to specific companies´ needs (ECORYS, 2010; CEDEFOP, ILO, 2010)

The European Union's new strategy for sustainable growth and jobs, Europe 2020, puts innovation and green growth at the heart of its blueprint for competitiveness. However, there are no explicit overarching national strategies targeting green skills needs (CEDEFOP, ILO 2010). Some Member States are moving faster than others to rectify this, with France launching its recent mobilisation plan for green jobs, and the UK government recently launching a consultation exercise, entitled Meeting the low carbon skills challenge (BIS, 2010). The EU suffers from systemic weaknesses in its skills base which limit its productivity and competitiveness in today's economy, and reduce its capacity to exploit the opportunities offered by green growth. These deficits in management skills and technical job-specific skills (many of which are related to science, technology, engineering and mathematics [STEM]) are a greater concern than shortages of 'new' green skills. (CEDEFOP, ILO 2010)

Skill development strategies need to enable people to add to their existing skills through training tailored to their particular needs and made accessible through a wide range of tools and methods. More emphasis is needed on training the trainers. There are not enough trainers and teachers aware of environmental issues and able to teach new techniques. Shortages are particularly acute in the energy, agriculture and construction sectors.

The training can be delivered via a wide variety of means; these include distance learning or e-learning, training-on-the-job, product-schooling (teaching skills related to a specific product, often by the manufacturer of the product), correspondence courses as well as postgraduate programmes.

Generic skills need to be improved across the entire workforce. In this sense, generic skills refer to both skills required in almost any occupation and the green skills that should be part of any job. Given a sound basis of generic skills, upskilling or 'adding to' existing job-related skills will enable someone to carry out the full range of tasks required by a new green occupation (see Table below).

Examples of upskilling to new occupations in EU Member States

Member State	Occupation(s)	Core training	Upskilling	New occupation
Denmark	Industry electrician/energy technologist	VET qualifications/ tertiary engineering qualifications	Knowledge of energy sources, ability to integrate energy systems, project management	Manager in renewable energy
	Industrial operator/Industry electrician	VET qualifications/upper secondary qualifications	Assembly, installation of parts, use of tools	Wind turbine operator
Estonia	Construction workers	No professional standard	Knowledge of energy systems, data analysis, project management	Energy auditor
France	Recycling sector workers	General certificate of vocational qualification	Sorting and reception techniques, knowledge of conditioning and storage	Waste recycling operator
	Product design and services	22 initial training courses with varying specialisation	Integrating environmental criteria in design process, integrated assessment and life cycle analysis	Eco-designer
Germany	Electronic/mechatronic technician	Initial vocational training	Electronics and hydraulic systems, safety procedure, operation and services	Wind power services technician
	Plumber/electric and heating Installer	Initial vocational training	Technical training, knowledge of administrative procedures, entrepreneurial skills	Solar energy entrepreneur/ Installations project designer
United Kingdom	Engineer in energy sectpr	Tertiary engieneering qualifications	Installation and maintenance of low-carbon technologies, customer service skills	Smart energy expert/ smart energy manager
	Commodity trader/ broker	Tertiary qualification	Practical skills on functioning of carbon market, understanding of trading tools	Carbon trader/broker

Source: CEDEFOP, 2010.

Uncertainty about environmental regulations and policies makes it difficult to anticipate skill needs. In order to address this barrier, policy makers should develop consistent, cohesive and stable policy frameworks and coordinate different policies, for example, by integrating a skill strategy into environmental policies (CEDEFOP, ILO, 2010.).

The most common method of financing skills programmes for green jobs is usually a mix of public-private as there is considerable public funding of skills programmes conducted in partnership with companies. Many Member States make public funding available for environmental programmes, with the provider usually then being a private company or collection of companies seeking to

upgrade skills for their workforce. Public funding also targets secondary and tertiary education on a large scale, for example the establishment of special skills academies are usually funded by national governments rather than the private sector. Financing from the EU also plays a role: in countries such as the U.K., a significant proportion of European Social Fund (ESF) funding is geared towards developing the skills necessary for the green economy. However, some countries make little or no use of ESF for promoting green skills. A way forwards is to ensure that European funds include a dedicated element of funding that can only be used for green skills programmes. (ECORYS, 2010).

Many environmental programmes do not have universal recognition of the qualifications participants receive through non-formal and informal learning. There are also multiple entry routes and varied levels of qualifications (high-, medium- or low-skilled). Efforts need to be devoted to improve the recognition, transparency and portability of qualifications and competences. European qualifications and standards in green sectors could help to increase the mutual trust among European training providers, allow for better quality of training; improve the public image of the sector; and increase the mobility of workers in the sector. (ECORYS, 2010).

French national plan for a mobilization of the industries and the territories toward a development of jobs and skills in a green economy

According to French statistics there were about 400 000 jobs in the green field in France in 2008; the annual growth rate of these jobs was of about 4,2%, compared to the global average rate of one percent. Most of these jobs are now mature like those in water purification or waste treatment. Others are recent or face a rapid increase in investments like energy performance in buildings or renewables. The educational and training system is not always ready to cope with this demand of skilled workers and professionals often have to take the lead during a period of adaptation.

The mobilisation plan was born in France as a part of the dynamics of the Environment Grenelle with the participation of all civil society actors. The committees of this plan are organised along the same principles as the Environment Grenelle with the representatives of the major local, professional, non governmental, trade unions and State organizations to work together on an agreed-upon transition.

Eleven sectors were chosen to study the gross evolutions in skills and job numbers and the way to manage the probable transitions: Agriculture and Forest, Cars, Building, Water, Wastewater, Waste and Air, Electric construction and network, Renewables, Refining, biofuel and green chemistry, Tourism, Transportation, Professions of the sea and the seaside, and Biodiversity and ecologic services provided by nature.

The conclusions of this work showed that no massive green and greened jobs creations await, but rather a progressive and massive change in professional attitudes and skills, not only in new technologies but in all fields (i.e. green driving, green cleaning, bio cooking, industrial eco-design, corporate eco-management, etc.). For fields like renewables or building, the skilled professionals and the trainers are already not sufficient. Finally, recommendations for the training system and for the content of courses and diplomas were defined for each sector.

All the participants contributed to producing recommendations that are most suitable for serving the ambition of enabling the country to succeed in changing its growth model. They also seized the opportunity to extend this to include occupational integration for all French people - regardless of whether they already had a job, were going through an occupational transition or were jobseekers –especially young people.

Source: Mobilisation Plan for Green Jobs in France, CEDEFOP 2010

IV. Social dialogue and European employers' organizations and trade unions' work on environment.

Social dialogue at the EU

Governments, trade unions, employers and other stakeholders around Europe are largely in agreement that the green economy has the potential to create a significant number of jobs in the future. (Eurofound, 2009).

As a part of the Treaty establishing the European Community (TEC), European social dialogue is a fundamental element in the European social model. It encompasses the discussions, negotiations and joint actions undertaken by European social partners.

At the EU level, workers are represented by the European Trade Union Confederation (ETUC). European employers are represented by three different organisations: the European Centre of Enterprises with Public Participation and of Enterprises of General Economic Interest (CEEP; BUSINESSEUROPE and UEAPME (small and medium businesses).

The involvement of the social partners at the European level is organised around three different types of activities (ETUC, undated):

- tripartite consultation, which describes the exchanges between the social partners and the European public authorities;
- consultation of the social partners, which covers the activities of the consultative committees and the official consultations
- European social dialogue, the name given to the bipartite work of the social partners, whether or not it stems from the official consultations of the Commission.

A mixed picture emerges regarding the existence of tripartite social dialogue structures and processes on green issues. In some countries, there is a lot of activity, whereas in others no such activity is recorded, even if at times there is an established tripartite social dialogue. In other countries, tripartite social dialogue has not been established in relation to any issues (Eurofound, 2009).

Tripartite structures dealing with green issues

Some countries have tripartite bodies that deal with environmental issues, such as the Environmental Economic Council in Denmark, although formal social dialogue is yet to be set that deals specifically and only with green issues in Denmark. In Finland, the National Commission on Sustainable Development has been established. In Romania, a National Standing Committee on Sustainable Development has been founded, which is a tripartite body that deals with a range of issues concerning sustainable development. In Slovenia, there are two tripartite social dialogue structures that are relevant to green issues: the Council for Sustainable Development and the Inter-service Group on Climate Change. Finally, in Spain, in 2008, social dialogue on green issues was carried out within the framework of the country's standard tripartite social dialogue structures. In France, through a national environment initiative a range of ad hoc working groups were created that include representatives of the government, trade unions, employers and NGOs involved in environmental issues. Furthermore, France's Economic and Social Council became the Economic, Social and Environmental Council. (Eurofound, 2009).

The European social dialogue has brought many results, notably the adoption of some 60 joint texts by the interprofessional social partners: this process supplements the national social dialogues existing in the majority of the Member States.

Both workers and business organizations have extensive experience on environment and have participated in the different public consultations organized by the Commissions specifically on climate change, energy and energy efficiency.

Workers and trade unions together with employers are also represented at the European Economic and Social Committee (EESC[17]), a body with an advisory role that provides recommendations to the EU Commission on different European policies and legislation to be developed, by assisting the European Parliament, Council and European Commission, promoting the development of a more participatory European Union, expressing the views of and securing dialogue with organised civil society; promoting participatory democracy, as well as the role of civil society organisations. EESC members are employers, workers and other relevant stakeholders. One of its five committees deals with agriculture, rural development and environment.

European employers' organizations and trade unions' work on environment

Environmental and social goals might be mutually reinforcing

Social partners are more likely to cooperate in environmental protection if a win–win outcome is a visible one for all.

The Green Workplace projects in the UK for example, while seeking to protect the environment, also aims to make cost savings that contributed to preserving jobs in the companies taking part in the project.

In Germany, the Network Resource Efficiency project relies on cooperation between associations to boost information exchange among companies leading to job-preserving cost savings, while at the same time boosting the capacity of workers and their skills to identify ways to improve energy efficiency.

The Italian CGIL, along with the environmental group Legambiente, have identified areas of intervention to contribute to the struggle against the recession and environmental degradation, based on: the energy restructuring of housing stock, the development of renewables, energy saving and efficiency, eliminating illegal dumps from the territory and reclaiming polluted industrial sites.

The Green4Sure project is a joint initiative between the Trade Union Confederation of the Netherlands and environmental organisations. It seeks to encourage public authorities, enterprises and citizens to make more sustainable choices, in keeping with the government's ambitions. Some of their recommendations were incorporated into the Dutch energy policy aiming for a "green new deal" in order to cope with the effects of the economic crisis.

The Eurofound's report "Greening the European Economy: Responses and initiatives by Member States and social partners" shows that trade unions and employer associations have different approaches to the issue of greening the economy. Employers initiatives are often embedded in corporate social responsibility strategies. Employers are concerned with ensuring that companies remain competitive while undertaking the process. Employer actions are also often driven by compliance issues, particularly with environmental legislation.

In terms of environment, Business Europe[18] believes that companies have always played a major role for improvements in environmental performance and they will remain the primary source for innovation required to reconcile environmental protection and economic growth. For BUSINESSEUROPE, a successful European environment policy must, in particular:

[17] Committed to European integration, the EESC contributes to strengthening the democratic legitimacy and effectiveness of the European Union by enabling civil society organisations from the Member States to express their views at European level. More information: http://www.eesc.europa.eu

[18] More information about BUSINESS Europe position on environment can be seen here: http://www.businesseurope.eu/content/default.asp?PageID=656

- Select environmental objectives on a comprehensive scientific knowledge basis and in a full life-cycle perspective
- Place technological innovation at the heart of environmental strategy
- Give full consideration to the impact on the competitiveness of EU industry and to the need for favourable, stable and predictable framework conditions in which businesses can operate and invest

In general terms, European workers and trade unions, represented by the European Trade Union Confederation (ETUC) believe that protecting the environment, reducing GHG emissions and addressing climate change impacts, as well as reducing pollution at the workplace need to all be done urgently. They also believe that this shift towards sustainable development presents an opportunity for job creation for Europe. However, certain sectors and some specific areas of the region that heavily depend on highly polluting sectors will be negatively impacted and job losses might take place. In order to ensure that this transition towards a cleaner and more sustainable development is fair for workers, specific measures supporting workers need to be defined and implemented. Workers and trade unions need to have a voice and be part of the decision-making process as they will be directly impacted by environmental policies.

The ETUC has held a pioneer role in the study on the links between environmental policies and employment. In 2007, it carried out a study that considered the challenge for employment of the transition towards a lower CO2 European economy by 2030, in four key economic sectors: energy production, transport, steel and cement industries, and construction/housing. The study considered a number of scenarios for a 40% reduction in CO2 emissions by the year 2030 and the possible effects on European employment and skills. Case studies of eleven European countries were also analysed.

The ETUC has elaborated a common position by European trade unions on four specific areas: sustainable development, energy and climate change, REACH[19] regulation related to sound management of chemical products, and nanotechnologies. In addition the ETUC has coordinated specific projects with European affiliates on sustainable mobility and greening workplaces[20].

In terms of climate change, the ETUC believes that the time has come to put forward a radical economic and industrial transformation involving a vision and objectives for the medium to long term, taking into consideration the fact that climate change is exacerbating the inequalities within and between the various regions of the world. European trade unions' position on climate change pivots around the concept of just transition. In fact, the ETUC has consistently called for a 'Just Transition Roadmap' to accompany the EU's climate and energy goals and strategies. 5 elements must be used as foundations towards a greener and socially just economy:

- Participation - Social dialogue, negotiation and participation are tools which reconcile the promotion of quality employment and job creation in European economies.
- Job creation and maintenance - Green and decent jobs can be created through domestic investments in (new) low-carbon technologies, in R&D and innovation, and technology transfer.
- Ensuring the greening of training, education and skills - Government-led, active education/training and skills' strategies are fundamental in the transition to a low-carbon, resource-efficient economy, as recognised by the Commission's proposals.

[19] Under REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances), companies manufacturing or importing chemical substances in quantities of one tonne or more a year will be required to register them to show that they can be used safely. In addition, producers of substances of very high concern, such as carcinogens or toxins that accumulate in the environment, will need to obtain authorisation before using or placing them on the market (ETUC, undated)

[20] Both areas of work can be seen here: http://www.etuc.org/r/1834

- Trade union rights - Respect for labour rights and other human rights is essential to ensure a 'Just Transition' within Europe and globally.
- Social protection - Public policy must also provide a safety net through active labour market policies, strong social protection and support measures.

In terms of REACH, the ETUC is convinced that this reform will have huge potential benefits, not only for the health of millions of workers exposed to chemicals on a daily basis, but also for Europe's industrial future.

Currently the ETUC focuses its European actions on the petition for a "Sustainable New Deal" or a Global Compact Europe, in order to put a stop to increasing inequalities, rising poverty and exclusion, soaring unemployment, work insecurity that affects particularly young people, and growing disillusion about the European project. A greater consultation with social actors and a new emphasis on collective bargaining and social dialogue are fundamental components of this strategy.

An essential point calls for the re-launching of growth policies and to overcome austerity. Growth policies will have to include green sectors as a priority. European industrial and investment policies aimed at meeting economic and environmental challenges should give priority to investments in sustainable infrastructure, research and development, climate technology and renewable resources. They should not to be included in the calculation of public deficits.

Action at the national level: trade union experience

The involvement of trade unions in environmental issues – and climate change in particular – has increased noticeably in recent years. They are demanding a voice in policy decisions related to greening processes and the creation of green jobs, not confronting social and environmental interests. Their proposals cover sectors of the entire economy and not only new green sectors.

Unions are active at either the national, sectoral, plant or individual level under different systems of industrial relations and legal frameworks, and through different channels:

- taking part in political debates on green topics in a bilateral or tripartite manner;
- producing publications that specifically address green issues or potential for green jobs creation;
- arranging training courses for skills for green jobs;
- organising ways in which individual employees can design environmentally friendly workplaces, thereby improving workers' involvement in and commitment to green topics.

At the national level, both trade unions and workers participate with policy-makers in policy-making decisions related to green jobs creation; at an industry level, for example by contributing to the forecasting on skills needs programmes and designing adequate training initiatives; and at an enterprise level, where they contribute to greening workplaces.

A good example stemming from the trade union movement is how to integrate environmental concerns in collective agreements. In Belgium, as part of the Belgian recovery plan, trade unions negotiated the so-called 'eco-cheque' that is a wage premium, granted under certain conditions with social tax exemptions, designed to encourage the purchase of environmentally-friendly and sustainable consumer goods.

Another Belgian experience is the adoption of the so-called "Green Marshall Plan" by the Walloon government in 2009. This plan aimed at creating competitiveness hubs, stimulating the creation of activities, easing the tax burden on business, boosting research and innovation in connection with business, and up killing for employment by giving them a sustainable dimension. A budget of €3 billion over four years (2010-2014) was planned. Elements of this Plan included workshops in the sustainable construction sector, with a tripartite structure (social partners and public stakeholders). To do this, skills centres for environmental training were built. According to the Walloon Region's forecasts, over 128,000 new homes should be built by 2020. Finally, as of 2014, the low-energy

standard should be applied and from 2017, the passive house standard should become compulsory in its turn.

At the national level, almost all Member States have developed sustainable development strategies, and several countries have set up bodies, institutions or structures – some of which are tripartite – to deal with green issues and the transformation of the economy to a more sustainable form.

In Denmark, a programme has been funded and implemented on retraining for staff from several shipyards to work in the offshore wind industry. Major funding has been funnelled into the creation of the Lindoe Offshore Renewable Centre (LORC) and its reskilling programmes. The creation of the Centre was driven by the regional communities and professional organisations concerned, in cooperation with social partners. The LORC council includes representatives of the Metal Workers Union and the United Federation of Danish workers.

The UK « Green workplaces » are union projects focused on the workplace level, which aim to engage workers and management in actions to reduce energy use and the ecological footprint of companies. They feature awareness raising activities, training workshops, as well as joint audits, consultations and other initiatives.

An initial round of 13 pilot projects allowed for the training of 97 environmental reps, and developed strategic initiatives on the reduction of CO2 emissions and efficient use of resources. Amongst these projects was that of the TUC in United Utilities that created a national employer initiative called 'Managerial Carbon Champions' alongside a trade union agenda on reduced energy use and waste production in 50 sites. A TUC survey in 2009 identified more than 1300 workplaces with some kind of green project underway. This survey highlighted the need for a more systematic approach to supporting union green reps to maximise their potential and influence among their work colleagues (Unions and Climate Change: A guide for union reps). The survey uncovered 430 different joint management-union committee structures/working parties discussing climate-related issues at work, pointing to high levels of enthusiasm among reps to be involved in the environmental workplace agenda. (Syndex 2011).

In the context of the worsening economic crisis in some countries, the German Confederation of Trade Unions (DGB) has put forth an ambitious programme of opportune investment and development for Europe, with a projection of 10 years and for all 27 countries that comprise the European Union.

Entitled "A Marshall Plan for Europe", German trade unions have proposed an investment programme (260 billion annually, approximately 2% of European GDP) to change the course of a Europe that is buried in the economic depression. The text calls for investments in sustainable energy generation; in the reduction of energy consumption; in sustainable industry and services; in education and training; in investigation and development; in modern transport infrastructure; in cities and municipalities with low emissions; in the efficiency of public administrations and the adequate participation of all social groups for a better future.

The programme is designed under the premise of a supranational project in the European sphere that relies on solid financing and in which all EU institutions are implicated, including the European Investment Bank (EIB).

German trade unions champion for a combination of institutional measures, direct public investments, subsidies to investments for companies and consumption incentives, as measures to combat the crisis in the short as well as in the long term, while ensuring growth and employment prospects. To do so, it is necessary to prioritize the restructuring and modernization of European national economies, promoting a low-energy consumption model that reduces the imports of fossil

fuels and CO2 emissions. To achieve this, the DGB therefore proposes an investment of 150 billion Euros per year.

In Spain, the trade union CCOO has been a pioneer in the work on green jobs. Through its institute ISTAS, the union is a source of novel studies on green jobs. These include sectoral studies that count the existing number of green jobs, analyze their quality parameters, and project employment creation under different regulation and policy measure scenarios. The number of studies available of a sectoral nature is quite impressive, such as those on renewable energies, mobility, sustainable construction, etc. Various studies have also been carried out for the different Spanish autonomous communities (in 2008, 2009 and 2010 in Navarra, Catalonia, Madrid and the region of Valencia).

Action at the national level: Employers' association initiatives

Employer associations have undertaken a broad range of initiatives with a view on contributing to mitigating climate change. Companies and employer organisations have sought to:

- engage in political debates on green topics in multi-stakeholder forums and in bilateral dialogues;
- issue publications on specific green issues such as environmental legislation, reducing emissions, remaining competitive in a green economy and employer involvement;
- organise events and information dissemination for awareness-raising among members;
- promote green skills for employees in order to prevent skill deficits.

UK employers are actively engaged in the promotion of strategies to increase the level of skills required in the green economy. In Italy, universities and private training providers are creating courses to develop the skills workers will need in the future green economy.

Another example is a project by the Bulgarian Industrial Association (BIA), funded by the European Social Fund and in partnership with the Trade Union Confederations CITUB and Podkrepa, of the assessments of workforce skill needs. The objective of the project, through which almost 2,000 companies were interviewed, was to evaluate green jobs at sectoral and regional levels. Conclusions outlined the need for the common definition of green jobs, including jobs created by climate change policies and setting up sectoral committees for the adoption of job evaluation criteria.

The Austrian employers' organisations (WKÖ) have created the Economic Energy Institute that aims to help small and medium-sized enterprises in the field of energy efficiency by providing them with advice on subsidies and other grants. The employers' organisations are also very active in terms of training. WKÖ has set up the Institute for economic promotion (WIFI14), which delivers training on jobs, specifically those associated with green growth.

V. European regulatory and policy framework

Green Jobs at the EU have been promoted mainly by environmental policies, in particular policies related to clean energy and climate change. Arguments to implement renewable energies policies and measures to reduce Greenhouse Gas Emissions (GHG) have included, in addition to environmental improvements, the potential to create new sustainable jobs. However greening the economy is a multidimensional challenge that requires actions in other policy areas besides environment. Such areas include economy, employment and training (particularly regarding professional qualification and development of skills), industrial policy, innovation and competitiveness.

Regarding the type of measures taken, voluntary commitments outnumber mandatory measures. As a result, there are a greater number of strategies, plans, communication initiatives and campaigns, than specific laws and regulations with associated budgets in relation to green jobs.

The EU climate change and energy package, a strategy for 2020 deserves special mention. It includes legal requirements to achieve quantitative objectives in terms of energy production supply by renewable energy sources, 20% of GHG emissions reduction and the objective of improving the energy efficiency by 20% in all EU member states. The targets were set by EU leaders in March 2007, when they committed to Europe becoming a highly energy-efficient, low carbon economy, and were enacted through the climate and energy package in 2009. As a result of the different Directives that have arisen from the EU 2020, new green jobs have been generated.

The efforts and results of EU policies relate particularly to GHG emission reduction and other climate change policies, based on scientific knowledge compiled by the IPCC (Intergovernmental Panel on Climate Change). They are centred on two perspectives, one in the short term with 2020 as a deadline for targets, and the other with 2050 as the reference year for long term roadmaps.

Motivating factors for the implementation of green job policies include the development of a strategy to set ambitious environmental goals in a context of increasing international environmental awareness, the need to reduce unemployment, and to increase the EU´s independence from fossil fuels, mostly imported from outside of the EU.

International environmental negotiations at the UN, particularly the United Nations Framework Convention on Climate Change (UNFCCC) and the UN Conference on Sustainable Development played a significant role in the definition of EU environmental policies in an increasingly globalized international scenario. In fact, green economy was one of the central topics of the RIO+20 Sustainable Development Conference.

In order to overcome the impacts of the financial and economic crisis in the EU that began in 2008, the EU adopted a series of economic stimulus packages that included investments to promote sustainable growth (although in smaller percentages than in other regions of the world). A limited number of assessments of the results of such stimulus packages have been undertaken four years after being adopted. In the meantime austerity policies and cutbacks have been implemented by most EU countries. Such policies are preventing sustainable sectors and green jobs from growing.

In addition to the impacts of austerity measures on green jobs, the economic crisis has resulted in further negative environmental consequences. For example, the drop of industrial production due to the economic crisis resulted in the fall of the price of CO2, which reached a historical low, heavily affecting the development of the European Emissions Trading System (ETS), an essential instrument to promote the renovation of the industrial network, and the investment in clean technologies and low greenhouse gas emissions.

Relevant policy documents about green jobs and green economy:

Leading by: DIRECTORATE GENERAL	TYPE OF DOCUMENT[21]	AREA OF ACTION	YEAR OF APPROVAL
Regional Policy	EU Strategy. EU's joint response to facing the challenges of globalisation, demographic change and the knowledge society. European Union's ten-year growth strategy	*The Lisbon Strategy* *Europe 2020*	2000 2010
D.G. Economic and Financial Affairs	EU Policy-Framework for regional financing. Legislations. Communication from the Commission to the European Council. Driving a coordinated EU response to the economic crisis	*The EU Cohesion policy* *The European Economic Recovery Plan*	2011 2008
	Financial plans at national level to cope with the 2008 economic crisis	*National stimulus packages*	2009
D.G. Employment, Social Affairs and Inclusion	EU policy: coordination of national employment policies; defined and applied by countries	*European Employment Strategy*	2010
	Non-binding objectives	*An Agenda for new skills and jobs*	2010
	EU Commission's agenda for better skills upgrading, anticipation and matching	*New skills for new jobs*	2008
	EU Parliament Resolution	*European Parliament Resolution on developing the job potential of a new sustainable economy*	2010
D.G. Enterprise and Industry	EU policy. Strategy to boost growth and jobs by supporting the EU industrial sector	*An Integrated Industrial Policy for the Globalisation Era, Putting Competitiveness and Sustainability at Centre Stage*	2010
D.G. Climate Action	EU regulation EU Initiative EU regulation	*The 2020 Climate Change and Energy Package* *Roadmaps 2050 for a Resource Efficient Europe* *Reduction in CO2 emissions of new passenger cars*	2008 2009
D.G. Mobility and Transport	EU Initiative	*Transport 2050*	2011
D.G. Energy	EU regulation- EU Directive EU regulation- EU Directive EU Initiative	*Energy efficiency Directive* *Eco-design of Energy-Using Products Directive* *Energy Efficiency and energy efficiency in buildings*	2012 2011 2010
D. G. Environment	EU Policy. Strategy to halt the loss of biodiversity and ecosystems	*EU biodiversity strategy for 2020*	2011
	EU Position	*Communication: "Rio+2 "*	2011-2012
D.G. Agriculture and Rural Development.	EU regulation Revision- EU legislation	*EU regulation framework on organic farming* *The future CAP reform*	1990-2010 2011

[21] Annex I includes a description of the different types of European documents, regulatory policies, recommendations and others.

European Union Policy

The 2000-2010 Lisbon Strategy

The Lisbon strategy was approved by the European Council in March 2000 with the strategic goal of "making Europe by 2010 become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion"[22]. The Lisbon Strategy was born as a European commitment to overcome the differences in growth and productivity between the EU and its leading global competitors of the time, USA and Japan. Europe's deficit in terms of technological capacity and innovation became the symbol of the ground on which to build upon in order to ensure EU competitiveness. The Lisbon Strategy was a set of political ambitions. Its most fundamental objectives were not based on Treaties or found in regulations or directives.

The strategy did not make any explicit mention of the promotion of green economy at the time. However the first modification of the strategy that took place a year later added the environmental dimension to those goals, emphasizing the need to review the relationship between economic growth and natural resources management. According to the 2010 review of the Strategy, although sustainability was a late entry into the Lisbon Strategy, the environmental pillar managed to significantly adjust the balance in previous years. However, environmental issues still remained to be fully incorporated into employment and competition policies. Environmental measures did not seem to be a fully integrated part of socio-economic development. Three recommendations were therefore identified in order to incorporate environment as part of the post-Lisbon employment and development European objectives:

• Green technologies and green innovation should be developed, with attention paid to enabling new markets and induced productivity gains;

• Jobs losses and gains derived from environmental policies should be systematically assessed and followed by accompanying measures if labour markets are significantly affected;

• Economic and financial tools should be used more, including actions to correct their anti-redistributive impact.

The Lisbon strategy was then renewed and reorganized in 3-year cycles (2005-2008 and 2008-2010) to ensure a more efficient implementation. These cycles were the basis for the implementation of the Lisbon programme and the national reform programmes. Among the four areas of work, energy was highlighted as an essential element in the economic shift towards environmental sustainability. The four focus areas follow:

1) Research and innovation: major investments in knowledge and innovation
2) Companies: promote business potential, especially in SMEs
3) Citizens: Increasing employment opportunity in prioritized areas
4) Infrastructure and energy: promotion of new energy policies

One of the crosscutting elements is the promotion of innovation and knowledge through the cooperation of different powers and players, promoting environmental initiatives especially in fields like resources, climate change and energy efficiency[23]. A review of the goals achieved at the end of the Lisbon Strategy in 2010 showed that most of them had not been reached. In fact, statistics revealed the EU society to be more unequal and less cohesive in 2010 than in 2000, when the Strategy was launched. Among the reasons for failure, the non-binding nature of the Strategy was highlighted. With the reviewed strategy new concepts such as flexicurity, came to the forefront,

22 Conclusions of the presidency. European Council, Lisbon, March 23-24 2000. http://www.europarl.europa.eu/summits/lis1_en.htm
23 Grande, Elisa. *International Training Centre of the ILO (ITCILO). "Territorial Strategies for Innovative Applications More Green. Latin American and European initiatives to seek greater social cohesion"*. 2010.

whilst other approaches such as gender mainstreaming became less prominent. At the same time, employment took on a quantitative perspective. Rather that "more and better jobs", the accent was now placed on the number of jobs created, regardless of their quality. However, more jobs are not always better jobs, and while figures for 2004-2007 made for a heartening reading, many of them were temporary or part-time jobs, often in vulnerable parts of the services sector[24].

Europe 2020: Europe's growth strategy for the 2010-2020 decade

As a follow up of the Lisbon Strategy and based on its lessons learned and results achieved, in early 2010, the European Commission launched a new strategy for the next decade, the Europe 2020 Strategy that aimed at promoting a quick recovery from the economic crisis and defines the main elements of the EU's 2020 vision. The new strategy provides a vision for the 21st century, based on three mutually reinforcing priorities:

- Smart growth: developing an economy based on knowledge and innovation.
- Sustainable growth: promoting a more resource efficient, greener and more competitive economy.
- Inclusive growth: fostering a high-employment economy that delivers social and territorial cohesion.

The strategy includes a new employment target: 75 % of the EU population aged 20-64 should be employed by 2020. This overall EU target is also to be translated into national targets[25]. A greater participation of youth, older workers and low-skilled workers and better integration of legal migrants should be promoted to meet this target.

2020 targets for the EU:

1. Employment: 75% of the 20-64 year-olds employed.

2. R&D and innovation: 3% of the EU's GDP (public and private combined) to be invested in R&D and innovation.

3. Climate change and energy:

- Reduction of 20% greenhouse gas emissions from 1990 levels (commitment to set a 30% reduction provided the major economies in the developed and developing world commit to undertake their fair share of a global emissions reduction effort).

- Production of 20% of energy with renewable energy sources.

- Increase of 20% in level of energy efficiency.

4. Education:

- Reducing school drop-out rates to below 10%.

- At least 40% of 30-34-year-olds completing third level education.

5. Poverty and social exclusion: at least 20 million fewer people live in poverty or are at risk of poverty and social exclusion.

Economic and Financial Affairs

[24] An analysis and evaluation of the methods used and results achieved by the 2000-2010 Lisbon Strategy can be seen here: http://www.europarl.europa.eu/document/activities/cont/201107/20110718ATT24270/20110718ATT24270EN.pdf

[25] Individual targets by member states can be seen here: http://ec.europa.eu/europe2020/pdf/targets_en.pdf

The EU Cohesion policy

The cohesion policy (or regional policy) of the European Union provides a framework for financing a wide range of projects and investments with the aim of encouraging economic growth in EU member states and their regions. The policy is reviewed by the EU institutions every seven years. The EU cohesion policy aimed at implementing the Lisbon goals to promote growth, competitiveness and employment, mostly through structural funds since it was first planned (2000-2006). In the phase 2007-2013 funds for environmental projects have tripled. 105 billion Euros will be invested in "green economy" which represents more than 30% of the regional policy budget[26] in the following activities: eco-innovation in SMEs, railway systems, promotion of clean urban transport, renewable energies, energy efficiency, eco-generation, energy management, waste disposal, water management, promotion of biodiversity and environmental protection, integrated projects for urban and rural renovation, rehabilitation of industrial premises and polluted soils and risk prevention. (EU Commission, 2009)

The latest legislative package covers the period 2014-2020 (EU Commission, 2012)[27]. Its proposals are designed to reinforce the strategic dimension of the policy and to ensure that EU investment is targeted on Europe's long-term goals for growth and jobs (Europe 2020). Investments on environment are promoted through the so-called cohesion fund. It will support investment in climate change adaptation and risk prevention as well as investment in the water and waste sectors, the urban environment, as well as investments in energy efficiency and renewable. In the field of transport the Cohesion Fund will contribute to investments in low-carbon transport systems and urban transport. There however is no reference to the creation of green jobs.

[26] Press Release IP/09/369, *"Cohesion Policy backs "green economy" for growth and long-term jobs in Europe"*. Brussels, March 9 2009. http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/369&format=HTML&aged=0&language=ES&guiLanguage=en

[27] General presentation on proposals for Cohesion Policy 2014-2020 can be seen here: http://ec.europa.eu/regional_policy/what/future/proposals_2014_2020_en.cfm

Results of the cohesion policy

Key figures and a snapshot of the policy's key achievements over the last 5-10 years.

Impact on the economy

- Rapidly increasing income in the poorest regions: Gross Domestic Product (GDP) per capita in the EU's least developed regions grew from 66% of the EU-25 average in 2000 to 71% in 2006
- Creating additional jobs: monitoring data shows that an estimated 2.2 million jobs were supported.
- Helping to reduce regional disparities: In levels of development between the most and least developed regions – the index of disparities fell by roughly a sixth thanks to sustained high growth in the less developed regions.

Impact on the environment

- Improving the environment: Cohesion Policy made an important contribution to help regions comply with EU environmental standards. For example, 20 million more people have been connected to modern water supply systems; 23 million more people have waste water treatment.
- More sustainable programmes: Half the Member States included indicators and targets for the reduction of greenhouse gas emissions into their Cohesion Policy programmes for the 2007-2013 period.

Impact on transport infrastructure

- Modernising transport links: Cohesion policy funded 2700 km of new motorways and 1200 km of high speed rail.
- As a result, average motorway density in Spain, Greece, Ireland and Portugal went from 90% of the EU15 average in 2000 to 111% in 2006. The challenge remains in the EU10, where motorway density stands at 35% of the EU15 average.

Impact on enterprise

Supporting business development: 230,000 SMEs received financial support (mainly grants but also loans and venture capital) and a further 1.1 million received advice and support for networking.

Impact on research

Investing in research and innovation: Nearly 46,000 research and development projects received support with the creation of over 20,000 new long term research jobs.

Source: Impacts and Results of Cohesion Policy[28]

All possible positive impacts of cohesion policies run the risk of disappearing due to the adjustment policies that less developed countries are being obligated to adopt, mainly those in the South of Europe. The outbreak of the financial crisis has resulted in capital flows from the periphery to the centre, exponentially increasing regional inequalities in Europe.

[28] More information of the Impacts and Results of the Cohesion Policy- http://ec.europa.eu/regional_policy/impact/index_en.cfm

The European Economic Recovery Plan

In November 2008 the European Council adopted the European Economic Recovery Plan[29]. Its objective was to drive a coordinated EU response to the global economic crisis.

The European Economic Recovery Plan has two key pillars, and one underlying principle:

• The first pillar is a major injection of purchasing power into the economy, to boost demand and stimulate confidence. The Commission is proposing an immediate budgetary impulse amounting to € 200 billion (1.5% of GDP), to boost demand.

• The second pillar rests on the need to direct short-term action to reinforce Europe's competitiveness in the long term. The Plan sets out a comprehensive programme to direct action to "smart" investment. Smart investment means investing in the right skills for tomorrow's needs; investing in energy efficiency to create jobs and save energy; investing in clean technologies to boost sectors like construction and automobiles in the low-carbon markets of the future; and investing in infrastructure and inter-connection to promote efficiency and innovation.

• The fundamental principle of this Plan is solidarity and social justice and work to protect jobs through action on social charges.

In particular, the plan includes a series of short and long term measures related to green economy:

- "Infrastructure and energy", such as the improvement of the energy efficiency of the housing stock and public buildings and promote rapid take up of 'green' products (item 6);
- "Research and Innovation": Developing clean technologies for cars and construction (item 9). [30]

It should be noted, that one of the Plan's strategic goals is shifting to a low-carbon economy and the creation of green jobs: "Speed up the shift towards a low carbon economy. This will leave Europe well placed to apply its strategy for limiting climate change and promoting energy security: a strategy which will encourage new technologies, create new 'green-collar' jobs and open up new opportunities in fast growing world markets, will keep energy bills for citizens and businesses in check, and will reduce Europe's dependence on foreign energy"[31]. The plan had an immediate budgetary impulse amounting to € 200 billion (1.5% of EU GDP), made up of a budgetary expansion by Member States of € 170 billion (around 1.2% of EU GDP), and EU funding in support of immediate actions of the order of € 30 billion (around 0.3 % of EU GDP). 5 billion Euros will be allocated to the 'European green cars initiative' and 1 billion to the "European energy-efficient buildings' initiative".

An analysis does not exist of the results achieved by the European Economic Recovery Plan undertaken by the EU Commission. A report carried out by HBSC[32] in May 2009, estimated that the EU's economic support to face the crisis would be of approximately 30 billion Euros for the period 2009-2010, of which 17-19 billion could be considered green. In comparison to estimates by the same institution for other economic powers, the share of green measures in stimulus packages varies in a considerable way. The EU lags behind South Korea, the United States and China, in

[29] The European Economic Recovery Plan can be seen here: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0800:FIN:EN:PDF

[30] Eurocan and CEOE Tenerife. The Economic Recovery Plan: Summary of EU measures in view of the current financial and economic crisis. http://www.ccaje.org/imagenes/6/Resumen%20Plan%20Europeo%20Recuperaci%C3%B3n.pdf

[31] Communication from the Commission to the European Council. COM(2008) 800 final. A European Economic Recovery Plan. Brussels, 26.11.2008. http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2008:0800:FIN:EN:PDF

[32] A Climate for Recovery, The colour of stimulus goes green, Authors: Nick Robins, Robert Clover, Charanjit Singh, HSBC, February 2009

terms of the total amount allocated to green measures, but the proportion of effort in anti-crisis packages is greater than in the U.S. or China. [33]

What appears evident is that stimulus measures in Europe were insufficient in light of regional unemployment rates.

National stimulus packages

Upon request of the Environmental Council in March 2009, the Environment Directorate General drafted a non-paper "Green Elements from Member States´ Recovery Plans"[34] which offers a critical view on the "green" effort made by Member States supported by information from public sources or provided directly by Member States.

The green sectors most often identified in Member States' recovery plans are energy efficiency, renewable energies, development of public transport and infrastructure and car scrapping schemes, while eco-technology and innovation, water and waste management and environmental taxes come in second place. The percentage of budget devoted to green purposes depends on the definition of environmentally-friendly measures taken by each country. Thus, comparing the share of recovery programmes devoted to the protection of the environment is extremely difficult. In addition, most studies do not evaluate the counterproductive or contradictory effects of green policies.[35]

Based on the countries´ own definition and counting, percentages of green measures vary from 1.3% in Italy, to 13% in Germany, and 21% in France. The promotion of green jobs was specifically selected as a focus area of the national economic recovery plans of Greece, Ireland and the United Kingdom[36].

The real impact of the green stimulus recovery packages remains to be seen due to the lack of available information regarding the results of implementing such green investments and measures. In addition, measures taken by a number of countries will end by 2014.

Employment, Social Affairs and Inclusion

European Employment Strategy

The European Employment Strategy (EES) is a 'soft' law mechanism designed to coordinate the employment policies of the EU Member States. While the objectives, priorities and targets are agreed at the EU level, the national governments are fully responsible for formulating and implementing the necessary policies. The European employment strategy provides a framework for EU countries to share information, discuss and coordinate their employment policies. Every year, national governments and the European institutions produce the "employment package" that includes the labour legislation and relevant plans approved to achieve the 2020 labour targets. In parallel to this procedure, there is an ongoing dialogue between the Commission, national governments, trade unions, employers' bodies and the other European institutions (European Parliament, European Economic and Social Committee, Committee of Regions, etc.).

33 Wuppertal Institute for Climate, Environment and Energy. Green European Foundation, 2009.

34 Non-paper "Green elements from member states´ recovery plans".
http://ec.europa.eu/environment/integration/pdf/recovery_plans.pdf

35 Schepelmann, Philipp; Stock, Marten; Koska, Thorsten; Schüle, Ralf; Reutter, Oscar. Wuppertal Institute for Climate, Environment and Energy. "*A Green New Deal for Europe Towards green modernization in the face of crisis*". Green European Foundation. Sept, 2009. 90pgs. / Höhne, Niklas; Burck, Jan; Eisbrenner, Katja. "Economic/climate recovery score cards. How climate friendly are the economic recovery packages?" Germanwatch, Ecofys. March 2009.

36 A detailed description of focus areas of national recovery plans can be seen here:
http://ec.europa.eu/environment/integration/pdf/recovery_plans_annex2.pdf

In line with the Europe 2020 strategy, the European Employment Strategy seeks to create more and better jobs. To reach these objectives, the EES encourages measures to meet three targets by 2020:

- 75% of people aged 20-64 in work,
- school drop-out rates below 10%, and at least 40% of 30-34–year-olds completing third level education
- At least 20 million fewer people are in, or at risk of poverty and social exclusion.

The European Employment Strategy should therefore ensure that labour markets can adapt to all changes including a low carbon economy; and that new skills are available for new greener jobs through better anticipation and matching in the short and longer term.

An agenda for new skills and jobs: A European contribution towards full employment

In November 2010, as part of the 2020 Strategy, an agenda for new skills and jobs to set out actions to boost employability and drive reform was launched as a flagship initiative in order to achieve an employment rate of 75% for women and men aged 20-64 years. As the agenda recognizes, there is an urgent need to focus on action-oriented policies to ensure that Europe's labour market is ready to face the challenges posed by the current economic situation and the severe environmental crisis. Furthermore, in times of budgetary constraints and unprecedented global competitive pressures, EU employment and skills policies should be developed to help shape the transition to a green, smart and innovative economy and must be a matter of priority.

Key actions include promoting stakeholder engagement implementing lifelong learning strategies, producing an EU Skills Panorama to forecast skills supply and labour market needs, completing the European Skills, Competences and Occupations Classification (ESCO), presenting legal instruments on the enforcement of the rights of EU migrant workers, and proposing guiding principles to promote enabling conditions for job creation. The initiative supports the move towards a low-carbon economy by anticipating future skills needs to help the EU to move towards a low-carbon economy.

In addition, the flagship also proposes actions to strengthen the role of public employment services. They can play a key role in providing people with information, guidance, as well as matching services and training to take advantage of opportunities arising from the move towards a low-carbon economy.

Serious deficits in qualified professionals, in management and technical, job-specific skills are hampering Europe's sustainable growth objectives. This is also the case for shortages in areas critical for innovation, in particular in STEM (Science Technology Engineering Mathematics). In the automotive sector and shipbuilding, for example, demand for hybrid vehicles and offshore investment in sustainable energy already requires new skills. Indeed, significant investments in "green" skills need to be made to ensure Europe lives up to its ambition of increasing the number of green jobs.

European Parliament Resolution on developing the job potential of a new sustainable economy

In September of 2010, the European Parliament (EP) adopted a very complete and interesting resolution presented by the Employment and Social Affairs Committee on developing the job potential of a new sustainable economy.

At the heart of the resolution was a call to the Commission to propose by 2011, a strategy with legislative and non-legislative measures to encourage green jobs. At the time this report was drafted, the Commission had not approved any campaign on developing green jobs37.

According to the document, Member States should use the European Globalisation Adjustment Fund, the European Structural Funds and the Cohesion Fund to implement European objectives and to create new sustainable "green" high-quality jobs, in line with the ILO "Decent Work" programme, and promote gender equality in a sustainable economy.

The Resolution also urged to develop specific policies to ease the transition towards a green economy, especially through re-skilling, training and lifelong learning of high, medium and low qualified workers in sectors that will be affected by changes in a company's or industry's production. It also encouraged the promotion of EU-wide exchange of best practice examples, in particular on the strengthening of information and consultation of workers, and the establishment of European Works Councils; to research and measure the impact of environmental and climate change policies on net employment creation.

It also stresses the importance of the public sector leading by example, adopting particularly pre-commercial procurement and linking public subsidies to the inclusion of high environmental and social standards.

Incentives are needed to prompt companies to invest more in clean technologies. The EP calls for efficient funding systems and tax breaks to help small and medium-sized firms steer towards green employment policies and ensure green innovations and production.

The text adopted emphasises that a socially just transformation is a basic component of sustainable development and an essential prerequisite if people in Europe are to lend their support to it. It also stresses that the consequential costs of a lack of transformation management may be much higher than anticipatory investments.

According to this EU Parliament resolution, the European Union and the Member States should develop a framework for anticipating change and restructuring, by including essential environmental issues in social dialogue, at all levels of consultation, with emphasis on sectoral negotiations; by strengthening social security, income support systems and proactive sectoral training initiatives.

Lastly the resolution emphasises that, in order for the transition to be socially just, social partners should have a participatory partnership role to green the workplace.

Enterprise and Industry

An Integrated Industrial Policy for the Globalisation Era, Putting Competitiveness and Sustainability at Centre Stage

The European Commission's flagship initiative on an industrial policy for the globalisation era, part of the Europe 2020 Strategy, highlights the need for industry to play a key role if Europe is to remain a leading economic power.

This policy document sets out a strategy that aims to boost growth and jobs by maintaining and supporting a strong, diversified and competitive industrial base in Europe offering well-paid jobs while becoming less carbon intensive. The document acknowledges climate and energy as an area where additional efforts are needed: industry needs to also adapt to the challenges posed by

[37] The EU Employment, Social Affairs and Inclusion Department has devoted research efforts to the issue of assessing employment impacts of environmental policies as well as identification of skills needs for the creation of green jobs. This information can be seen here: http://ec.europa.eu/social/main.jsp?catId=370&langId=en&featuresId=63

climate change and to grasp the opportunities of new low-energy and resource saving processes and products. The ability to adapt to changes will be pivotal for the competitiveness of the European manufacturing and for achieving the EU's overall growth and job objectives. Industrial policy may have a significant impact on the developments in this area and it must both support and stimulate the continuous process of adjustment to changing conditions and restructuring that is essential to remain globally competitive.

Climate Action

Climate Action is an area where the UE has been very active in recent years. Different binding and non-binding initiatives have been approved and are being developed. These initiatives can be categorized according to their end-year[38]:

2008-2012: Under the Kyoto Protocol, the 15 countries that were EU members before 2004 committed to reducing their collective emissions to 8% below 1990 levels by the years 2008-2012. Emissions monitoring and projections show that the EU-15 is well on track to meet this target. Most Member States that have joined the EU since 2004 also have Kyoto reduction targets of 6% or 8% which they are on course to achieve.

2020: For 2020, the EU has committed to cutting its emissions to 20% below 1990 levels. This commitment is one of the headline targets of the Europe 2020 growth strategy and is being implemented through a package of binding legislation. The EU has offered to increase its emissions reduction to 30% by 2020 if other major emitting countries in the developed and developing worlds commit to undertake their fair share of a global emissions reduction effort.

2050: For 2050, EU leaders have endorsed the objective of reducing Europe's greenhouse gas emissions by 80-95% compared to 1990 levels as part of efforts by developed countries as a group to reduce their emissions by a similar degree. The European Commission has published a roadmap for building the low-carbon European economy that this will require.

In addition to climate change –GHG emission reduction, climate change adaptation and climate finance to developing countries- other areas for action related to climate include energy, low carbon technologies, development of a low-carbon transport system, forest and agriculture and ozone-layer protection. A brief description of the most relevant policies follows:

The EU 2020 Climate Change Package

In December 2008, the EU approved the Climate Change and Energy Package, consisting of six proposals to reach the so-called 20-20-20 goal by the year 2020 (A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency; A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels; 20% of EU energy consumption to come from renewable resources). The EU leaders also offered to increase the EU's emissions reduction to 30%, on the condition that other major emitting countries in the developed and developing worlds commit to do their fair share under a global climate agreement.

The European Commission analyzed the impact on employment of moving beyond 20% of GHG emission reduction and found that "The net effect consists of the creation of jobs (directly and indirectly) in certain sectors and the reduction of jobs in other sectors. For the EU a reduction of GHG emissions from 20% to 30% is expected to create a further stimulus for employment in the renewable sector and in energy efficiency sectors."[39] A 2009 study carried out by the EU

[38] Additional information on EU policies on climate can be seen here: http://ec.europa.eu/clima/policies/brief/eu/index_en.htm

39 COM(2010) 265 final. Brussels, 26.5.2010. COMMISSION STAFF WORKING DOCUMENT *accompanying the* COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Analysis of options to move beyond 20% greenhouse gas emission reductions and assessing the risk of carbon leakage. Background information and analysis. Part II. http://ec.europa.eu/environment/climat/pdf/26-05-2010working_doc2.pdf

Commission finds slight positive net employment effects of up to 0.1% for supporting policies to meet the 2020 RES targets[40].

Roadmaps 2050 for a Resource Efficient Europe

The Commission launched this flagship initiative for sustainable growth to provide a long-term framework for actions in different policy areas (energy, climate change, transport, industry, raw materials, agriculture, fisheries, biodiversity and regional development). The main roadmaps are the following:

- **A low-carbon economy roadmap 2050**: The European Commission is looking beyond 2020 objectives and setting out a plan to meet the long-term target of reducing domestic emissions by 80 to 95% by mid-century as agreed by European Heads of State and governments. It shows how the sectors responsible for Europe's emissions - power generation, industry, transport, buildings and construction, as well as agriculture - can make the transition to a low-carbon economy over the coming decades. A low-carbon economy would have a much greater need for renewable sources of energy, energy-efficient building materials, hybrid and electric cars, 'smart grid' equipment, low-carbon power generation and carbon capture, as well as storage technologies. To make the transition to a low-carbon economy and to reap its benefits such as a lower oil bill, the EU would need to invest an additional €270 billion or 1.5% of its GDP annually, on average, over the next four decades. By stepping up climate action 1.5 million additional jobs could be created by 2020.

- **An energy roadmap 2050**: The Energy Roadmap 2050 explores the challenges posed by delivering the EU's decarbonisation objective while at the same time ensuring security of energy supply and competitiveness.

- **A roadmap for a resource-efficient Europe 2050**: The initiative for a resource-efficient Europe under the Europe 2020 strategy supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth. Transforming the economy onto a resource-efficient path will bring increased competitiveness and new sources of growth and jobs through cost savings from improved efficiency, commercialisation of innovations and better management of resources over their whole life cycle. In Germany alone a study suggests that resource-efficiency gains in manufacturing could generate cost savings of between 20% and 30% and up to 1 million jobs for the country.

Reduction in CO_2 emissions of new passenger cars

European Union legislation adopted in 2009 sets mandatory emission reduction targets for new cars and vans sold in the European Union, to ensure that the EU meets its greenhouse gas emission targets and tackles CO_2 emissions from both the production and consumer sides.

Road transport is one of the largest greenhouse-gas emitting sectors in the European Union. In order to reduce emissions in this sector, the European Regulation sets limits for new passenger cars. The limit[41] is 130 g of CO_2/km by 2015. From 2020, this level is to be reduced to 95 g of CO_2. These two targets represent reductions of 18% and 40% respectively compared with the 2007 fleet average of 158.7g/km.

40 Impact Assessment. Commission Staff Working Paper accompanying the Energy Roadmap 2050.
41 Set by the Regulation 443/2009 of the European Parliament and of the Council of 23 April 2009

For each manufacturer, the following percentages of passenger cars are taken into account in order to determine average specific emissions of CO_2: 65 % in 2012; 75 % in 2013; 80 % in 2014; 100 % from 2015 onwards.

In addition, this Regulation includes specific provisions for vehicles running on a mixture of fuel with 85 % ethanol (E85). Suppliers and manufacturers may introduce innovative technologies to reduce CO_2 emissions. The total contribution of these technologies may reach a maximum of 7 g of CO_2/km

Mobility and Transport

Transport 2050

The European Commission adopted in March 2011 a comprehensive strategy for a competitive transport system to increase mobility, remove major barriers in key areas and fuel growth and employment. At the same time, the proposals will dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050.

By 2050, key goals will include:

- No more conventionally-fuelled cars in cities.
- 40% use of sustainable low carbon fuels in aviation; at least 40% cut in shipping emissions.
- A 50% shift of medium distance intercity passenger and freight journeys from road to rail and waterborne transport.
- All of which will contribute to a 60% cut in transport emissions by the middle of the century. The proposals will dramatically reduce Europe's dependence on imported oil and cut carbon emissions in transport by 60% by 2050.

According to the previous assessment undertaken, the adoption of the decarbonisation of transport can be expected to have a favourable impact on ‘green jobs’.

Numerous studies indeed quantify and describe the trend in green job growth in Europe. A study from Ecorys outlines the manner in which the combination of environmental policy, regulation and public awareness has affected industries such as the automotive and transport sectors. The development in these sectors will, in turn, be a strong driver for employment in the eco-industry sub-sectors, notably in environmental technology, recycling and renewable energy sub-sectors. Another study pays particular attention to the direct and indirect jobs created as a result of the measures. The study finds that between 1.3 and 1.9 additional jobs will be created by any direct job generated.

Energy

2012 Energy Efficiency Directive

The EU needs to act to get on track to achieve its target for 2020 of saving 20% of its primary energy consumption compared to projections.

Energy efficiency is one of the most cost effective ways to enhance security of energy supply, and to reduce emissions of greenhouse gases and other pollutants. In many ways, energy efficiency can be seen as Europe's biggest energy resource.

In order to address these needs, in October 2012, the EU adopted the Directive on energy efficiency. This Directive establishes a common framework of measures for the promotion of energy efficiency within the Union in order to ensure the achievement of the Union’s 2020 20 %

headline target on energy efficiency, and to pave the way for further energy efficiency improvements beyond that date. It lays down rules designed to remove barriers in the energy market and overcome market failures that impede efficiency in the supply and use of energy, and provides for the establishment of indicative national energy efficiency targets for 2020.

The Directive includes the following actions:

- Energy companies are requested to reduce their energy sales to industrial and household clients by at least 1.5% each year
- A 3% renovation rate for public buildings which are “central government-owned and occupied”
- An obligation on each EU member state to draw up a roadmap to make the entire buildings sector more energy efficient by 2050 (commercial, public and private households included).
- The new directive also includes additional measures on energy audits and energy management for large firms, cost-benefit analysis for the deployment of combined heat and power generation (CHP) and public procurement.

The Directive does not include a binding target; instead it includes an indicative target of 20% energy savings and binding measures. This is expected to result in a reduced 15% total energy savings by 2020, well short of the 20% goal that member states had previously agreed on in 2007. The 15% will be complemented by fuel efficiency regulation for cars and new standards for products such as boilers.

Next steps:

In April 2013, member states are expected to present their national efficiency programmes and calculate what target they are to achieve. The European Commission will then evaluate them. If the Commission analysis of the national energy saving plans shows that the EU is not on track to meet the 20% energy savings target, it must add to the directive more binding measures to fill the gap. The savings will be calculated as of 2014 and there will be a review of the directive in 2016.

Prior to the Energy Efficiency Directive being approved, in March 2011 the European Commission adopted the "Energy Efficiency Plan 2011"[42] for saving more energy through concrete measures. The set of measures proposed aims at creating substantial benefits for households, businesses and public authorities: it should transform our daily lives and generate financial savings of up to €1000 per household every year and improve global revenues from climate-related business activities – mainly energy efficiency – are around €360 billion. These activities are also a source of new jobs and a way of cutting costs for businesses. It should improve the EU's industrial competitiveness with a potential for the creation of up to 2 million jobs.

The Commission’s Energy Efficiency Plan 2011, show the biggest energy savings are expected to be found in residential and commercial buildings, the manufacturing industry, and transport. In most cases, this would be either at no cost to the economy or achieved through investments that have very quick pay-back times.

Eco-design of Energy-Using Products Directive

The energy demand households accounts for 25% of the final energy needs in the EU. Energy consumption by consumer electronics and Internet is also steadily growing. The response is to act in two complementary ways: Energy Labelling of household appliances and Minimum Efficiency Requirements.

[42] The Energy Efficiency Plan 2011 can be seen here: http://ec.europa.eu/energy/efficiency/action_plan/action_plan_en.htm

In addition, in October 2009, the EU adopted a Directive on eco-design. Eco-design43 aims at reducing the environmental impact of products, including the energy consumption throughout their entire life cycle.

The production, distribution, use and end-of-life management of energy-using products is associated with a considerable number of important impacts on the environment, namely the consequences of energy consumption, consumption of other materials/resources, waste generation and release of hazardous substances into the environment. It is estimated that over 80% of all product-related environmental impacts are determined during the design phase of a product. Against this background, Eco-design aims to improve the environmental performance of products throughout the life-cycle by systematic integration of environmental aspects at a very early stage in the product design.

The directive does not introduce directly binding requirements for specific products, but does define conditions and criteria for setting requirements regarding environmentally relevant product characteristics (such as energy consumption) and allows them to be improved quickly and efficiently. The Directive applies to all energy using products (except vehicles for transport) and covers all energy sources.

Energy efficiency and energy efficiency in buildings

The EU's dependency on energy imports means that around €350 billion of the EU's wealth– around €700 per EU citizen, or 2.8% of the GDP – is exported every year mainly to oil and natural gas-rich countries. On average, EU Member States import more than half of their energy. Europe's building stock is responsible for 40 per cent of total energy use in the EU, and for 36 per cent of EU CO2 emissions; the largest source of greenhouse gas emissions in Europe.

In that context, improving the energy efficiency of Europe's building stock is central to meeting the objectives of the Europe Climate and Energy package, and also making the move to a resource efficient economy. Initiatives such as retrofitting walls and roofs with insulation, and improving energy management systems, have been identified as having potential for both residential and commercial buildings. Investing in improving the energy efficiency of Europe's housing stock would reduce energy consumption and generate employment.

Energy prices, especially oil, are expected to continue to rise in the coming years. Competitive economies will anticipate this and improve both the efficiency with which they use energy, and at the same time look for new sources to cut costs and ensure security of supply.

In May 2010, the EU adopted the Energy Performance of Buildings Directive44 which is the main legislative instrument to reduce the energy consumption of buildings. Under this Directive, Member States must establish and apply minimum energy performance requirements for new and existing buildings, ensure the certification of building energy performance and require the regular inspection of boilers and air conditioning systems in buildings. Moreover, the Directive requires Member States to ensure that by 2021 all new buildings are so-called 'nearly zero-energy buildings'.

[43] An overview of the Ecodesign legislation can be seen here: http://ec.europa.eu/energy/efficiency/ecodesign/doc/overview_legislation_eco-design.pdf

[44] The Energy Efficiency in Building Directive can be seen here: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010L0031:EN:NOT

Environment

Environmental policies in EU member states have been guided by policies adopted by the EU Commission. Areas covered by the EU Commission range from clean air, sound use of chemical products, noise control, waste management and recycling, water management, coastal areas and marine resource management, land use (rural and urban) and soil conservation, biodiversity protection, green public procurement, pollution control from industrial installation in addition to the above mentioned climate change.

The relation with labour, employment and productivity is addressed differently. Areas closer to the priorities of social actors and stakeholders such as trade unions and employers' organizations (pollution at the workplace, sound management of chemicals and climate change for example) integrate better the social and employment dimension and even provide specific civil society participation mechanisms.

In addition to policy development, the EU has developed the European Eco- Management and Audit Scheme (EMAS) that is a management tool for companies and other organisations to evaluate, report and improve their environmental performance. EMAS is a voluntary tool available to any organisation aiming to improve its environmental and financial performance and communicate its environmental achievements to stakeholders and to society in general.

The scheme has been available to companies for their participation since 1995 and was originally restricted to companies in industrial sectors. Since 2001 EMAS has been open to all economic sectors including public and private services. Currently, more than 4,500 organisations and approximately 7,800 sites are EMAS registered

Communication:"Rio+20: towards the green economy and better governance"

Rio+20 marked the start of a profound, world-wide transition towards a green economy – an economy that generates growth, creates jobs and eradicates poverty by investing in and preserving the natural capital upon which the long-term survival of our planet depends, and launched the reform of international Sustainable Development governance.

The EU supported the Rio+20 outcomes to establish green skills training programmes in priority areas such as energy, agriculture, construction, natural resource management, waste and recycling. Since the transition to a green economy will create jobs and replace others, the re-skilling of the existing workforce will be needed. This could include schemes to protect workers interests, providing social protection, and formalising informal work, for example, building on the "just transition" work of the ILO. Youth training programmes are also needed. These should support the school-to-work transition with specific training, and encourage national curricula in secondary education to include green skills.

EU biodiversity strategy for 2020

The European Commission has adopted a strategy to halt the loss of biodiversity and ecosystem services in the EU by 2020. There are six main targets, and 20 actions to help Europe reach its goal. Biodiversity loss is an enormous challenge in the EU, with around one in four species currently threatened with extinction and 88% of fish stocks over-exploited or significantly depleted.

The six targets cover:

- Full implementation of EU nature legislation to protect biodiversity
- Better protection for ecosystems, and more use of green infrastructure
- More sustainable agriculture and forestry
- Better management of fish stocks
- Tighter controls on invasive alien species
- A bigger EU contribution to averting global biodiversity loss

Nature-based innovation, and action to restore ecosystems and conserve biodiversity, can create new skills, jobs and business opportunities. The Economics of Ecosystems and Biodiversity (TEEB) estimates that global business opportunities from investing in biodiversity could be worth US$ 2-6 trillion by 2050.

Agriculture and Rural Development

An analysis of the EU organic sector

According to data from the Research Institute for Organic Agriculture as of the end of 2010, 10 million hectares of agricultural land in Europe were managed organically. Twenty-seven percent of the world's organic agricultural land is in Europe.

In Europe, 2.1 percent of the agricultural area, and in the European Union, 5.1 percent of the agricultural area is organic. In Europe, there were almost 280 000 organic farms, in the European Union almost 220 000. Compared to 2009, organic land increased by nearly 0.8 million hectares.

The countries with the largest organic agricultural area are Spain (1.5 million hectares), Italy (1.1 million hectares), and Germany (0.99 million hectares).

Sales of organic products amounted to approximately 19.6 billion Euros in 2010. The largest market for organic products in 2010 was Germany with a turnover of 6 billion Euros, followed by France (3.4 billion Euros) and the UK (2 billion Euros).

EU policy on organic agriculture:

The European Action Plan for Organic Food and Farming was first published in 2004 and set out 21 initiatives to achieve the objectives of developing the market for organic food and improving standards by increasing efficacy, transparency and consumer confidence. The plan aimed to achieve measures such as improving information about organic farming, streamlining public support via rural development, improving production standards or strengthening research. At least 26 countries or regions in Europe developed an action plan, many of them with quantitative targets.

In 2005 a specific regulation was adopted for rural development enabled member states to support the conversion to and maintenance of organic farming. Rural development programmes have enabled broader based support of the organic sector, for example investment in processing, training, marketing and promotion. Many non-EU countries also provide similar support.

In 2010, one of the key developments of the European organic sector was the launch of the new EU logo for organic products. Since July 1, 2010, the organic logo of the EU has been obligatory on all pre-packaged organic products that have been produced in all EU member states and meet the necessary standards.

EU regulation framework on organic farming

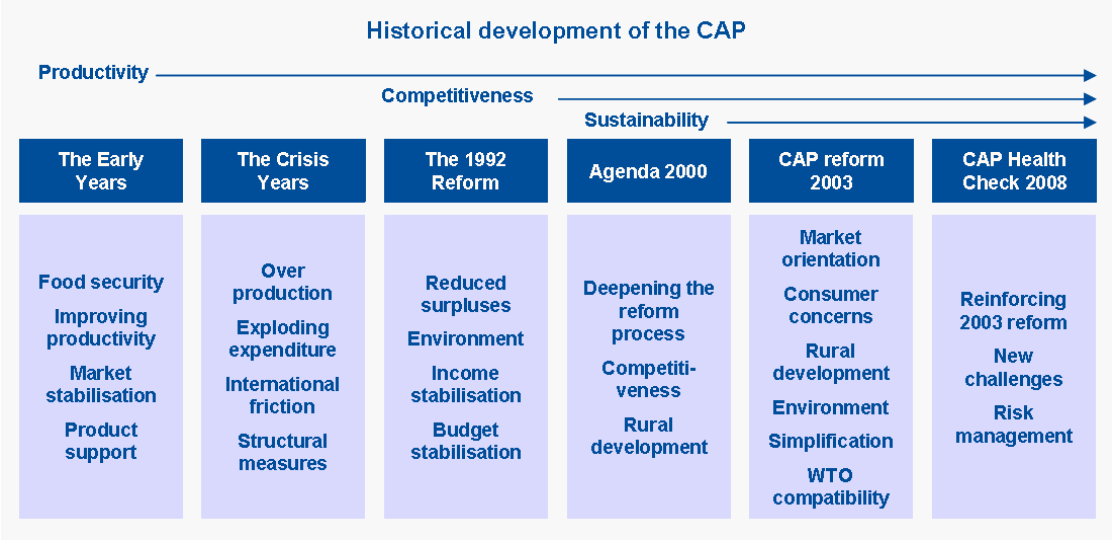
Organic farming relies on a number of objectives and principles, as well as common practices designed to minimise the human impact on the environment, while ensuring the agricultural system operates as naturally as possible. Typical organic farming practices include[45]:

- Wide crop rotation as a prerequisite for an efficient use of on-site resources
- Very strict limits on chemical synthetic pesticide and synthetic fertiliser use, livestock antibiotics, food additives and processing aids and other inputs
- Absolute prohibition of the use of genetically modified organisms
- Taking advantage of on-site resources, such as livestock manure for fertiliser or feed produced on the farm
- Choosing plant and animal species that are resistant to disease and adapted to local conditions
- Raising livestock in free-range, open-air systems and providing them with organic feed
- Using animal husbandry practices appropriate to different livestock species

The future Common Agriculture Policy reform

The Common Agricultural Policy (CAP) is one of the oldest policies of the European Union. Due to the CAP's long history; it is also a policy that has been reformed on many occasions, in particular during the past decade and a half.

A summary of these reforms:



Source: EU Commission, D. G. Agriculture and Rural Development

The current cycle of the Common Agricultural Policy (CAP) is due to end in 2013. Discussions are now underway to reform the policy for the period 2014 to 2020 that includes legal proposals designed to make the CAP a more effective policy for a more competitive and sustainable agriculture and vibrant rural areas, and contains an explicit recognition of organic farming.

[45] More information about organic farming in the EU can be seen here: http://ec.europa.eu/agriculture/organic/organic-farming/what-organic_en

Environment is one of the key elements that are being integrated in the new CAP reform. The Commission's proposal urges Member States to dedicate 25% of Rural Development funding to environment, climate and organic farming.

The European Commission has proposed a package of 'greening' measures that European farmers will need to satisfy to receive direct payments made under the Common Agricultural Policy (CAP). The EU executive's plans for the 'greening the CAP' centre on three areas:

- Improving biodiversity and reducing greenhouse gas emissions;
- Using direct payments to encourage farmers to rotate crops as a way to reduce fertiliser and pesticide use;
- Preserve at least 7% of land for focus areas such as buffer areas or permanent grassland to help reduce emissions.

In addition, the farms with organic certification could be exempt from the greening conditions due to their uncontested environmental benefits and possible climate benefits and will receive the 'greening' top-up without having to carry out the three measures.

VI. Conclusions and key messages

Much has been done by the EU in relation to green jobs creation, however much more needs to be done to allow green sectors their full potential to create jobs. The pioneering global work undertaken by the region is at risk if no ambitious progress on the measures is made. As unemployment is rising in Europe, investing in green sectors has to become the central cornerstone of social recovery measures.

Specifically and within the context of austerity, an update of how some policies are affecting employment change is needed, such as reduced support for solar energy in many European countries.

European environmental policies need to be combined with labour and industrial policies

Green jobs have been created in the EU mainly as a result of environmental-related decisions, expressly linked to the fight against climate change. Renewable energy production and energy efficiency improvements are two examples.

However, when it comes to green jobs promotion, emphasis has been placed on the environment dimension, meaning that the labour dimension has not in fact been fully exploited. The areas of EU labour policy which need consideration and improvement are: a green industrial policy to further boost clean sectors; programmes aimed at supporting SMEs to get them involved in green economy opportunities through information, targeted financial schemes and partnership promotion; and also skills policies for green jobs provision which cover a range of activities from education systems to vocational training systems. It should be noted that the lack of data (and attention) related to quality of employment is alarming.

Another area with considerable room for improvement is the reduction of environmental impacts at the workplace level. Workplaces are responsible for a large percentage of EU energy consumption, GHG emissions and pollution of both air and water. Some regulations approved by the EU over the last year in fact focus on measures to reduce pollution at industrial sites (Integrated Pollution Prevention and Control). However, much can be done to improve the sustainability of workplaces, industries and other areas. In this regard, the engagement of workers, trade unions and employers has been proven to be key to enacting improvement. Successful measures include capacity building programmes, dialogue and participation schemes that give a voice to the decision-making process, building green committees at the enterprise level and also introducing environmental clauses in collective bargaining.

There is a gap in EU policies, specifically active labour policies, to create green jobs. There exists a disconnectedness between environmental and employment policies, despite the fact that the EU Commission warned about this in an earlier assessment. Climate policies, biodiversity strategies, research and development and event energy and mobility policies do not consider the employment effects, nor the labour needs, to achieve the objectives set. A better coordination and greater policy coherence between the different EU Departments should lead to more efficiency and better results.

Environmental change itself and policy efforts at creating a more sustainable economy can significantly influence the labour markets. Policies aimed at greening the economy might imply some degree of labour reallocation within sectors. Addressing mismatches between demand and supply of employment and skills and ensuring that the transition is fair for all require appropriate labour market policies. As acknowledged by the European Council for an Energy Efficient Economy (ECEEE), for the Energy Efficiency Directive to have maximum impact must be a parallel job strategy to ensure a comprehensive approach to implementation. In addition, employment policies can actively contribute to mitigate environmental change by encouraging greener production

methods, greener workplaces, greener transport and commuting. Public administration and public enterprise can lead by example in this respect.

The EU acknowledges that greening the economy is a multidimensional challenge and therefore must be addressed through cross-cutting measures at sectoral level that include targeted economic and development policies along with industrial development, innovation and competitiveness policies.

The fact that inequality and unemployment has increased in recent years makes it more necessary than ever to consider transition issues of social justice, to reverse the negative trends of social cohesion. It is necessary to understand the labor and social impacts so that the transition can be socially beneficial and fair.

Good record on green jobs in Europe, need for deepen and improve measures

Green sectors tend to be more labour intensive than the non-environmentally friendly sectors. For example, a review of 40 European studies found that, on average, organic farms provide 10 to 20% more jobs per hectare and a growing body of evidence indicates that the recycling industry generates more jobs at higher income levels than landfilling or incinerating waste. However, differences in labour intensity are likely to diminish over time in technology-based sectors, once initial investments have been made; new green technologies mature and become more productive, as happens in other industrial sectors.

As a result of the diverse policies, initiatives and regulations adopted by the European Union over the last decade, the number of green jobs have largely increased, exceeding jobs in sectors such as the chemical industry (as is the case for jobs in energy efficiency in Spain) or the automobile sector (as is the case for jobs in renewables in Germany). Climate change and renewable energy production policies have had the highest impacts in terms of job creation. According to the data available, there are about 7,360,000 jobs in the EU in renewable energies, energy efficiency, retrofitting, organic agriculture, waste management and recycling.

In terms of sectors, renewable energies, followed by waste management and recycling and sustainable transportation are the sectors were more jobs have been created. Countries with higher numbers of green jobs are Germany, Spain and Italy with green jobs in renewable energy production.

The major employer, within renewable energy sectors, is solid biomass with more than 273,000 jobs (direct and indirect full time jobs), followed by solar photovoltaic and wind power with respectively 268,110 and 253,145 jobs estimated for 2010.

In terms of green jobs creation per euro invested, renewable energies, 52,700 jobs per billion Euros, is the sector with the highest job creation impact, almost twice those in energy efficiency in buildings, waste management and recycling and sustainable mobility, that tally around 20,000 jobs created per billion Euros invested.

Greening the EU budget and increasing the environmental objectives have the potential to improve its environmental performance and create new employment, something very much needed in most countries of the EU, where the unemployment rate is above 11% and topped 26 million people (Eurostat, 2012). It is now time for ambitious employment polices. Young people are the first casualties of the lack of jobs, with the youth unemployment rate reaching a new peak in November 2012, at 23.7 %, and labour market schemes for green jobs for young workers should be a priority.

Investing in a sustainable economy can produce long term and quality employment with gradually increasing social and environmental benefits.

Policies to address climate change and reduce the EU GHG emissions are good examples of this double dividend. Increasing climate targets by up to 30% of emission reduction will pay back with an increase of 0.6% growth in the European economy, creation of up to 6 million additional jobs and an increase of EU GDP by up to $842 billion. A full compliance with the EU waste policy, that is 50% for recycling, could create about half million additional jobs, while more sustainable farming and forestry practices offer potential both to maintain biodiversity and to enhance employment by supporting safer, more lasting jobs linked to local livelihoods rather than centralised systems of production. (FEEM, 2011).

Collective bargaining becomes key if new green sectors are to generate quality jobs. However, the challenges posed when organizing workers in new sectors needs special attention.

Local green jobs?

Some green sectors in Europe are growing; however this growth does not have a direct impact on job creation. One of the reasons for this decoupled effect is that part of the process is being developed in other regions of the world. Recycling is a good example. The EU has expanded paper and plastics recycling growth in exports, particularly to China. As a result jobs are being created overseas at the expense of EU based employment opportunities. The more opportunities taken for carrying out all steps of each sector, the more local jobs will be created.

Sectors such as retrofitting and green construction, often rely on labour-intensive and locally-implemented projects, resulting in local job creation and having a direct impact on unemployment rates.

The EU led the world in clean energy investments in 2010, spending nearly $81 billion. Over 85% of today's market for clean energy technologies is primarily in Asia and Europe. However, China remained the global leader in new wind energy installations for the fourth year in a row, installing more than 40 percent of all global wind turbines, or 18 GW in total. The European Union came in second with nearly 10 GW, followed by the U.S., India, and Canada. However, the EU's pole position on clean technologies and green sectors can not be taken for granted. In fact, the near future scenario for European solar PV companies seems alarming.

The role of social dialogue and engagement of employers and trade unions

Both workers and business organizations have extensive experience in the environment and have participated in the different public consultations organized by the Commissions specifically on climate change, energy and energy efficiency. However, in order to manage the transition this participation has to be strengthened.

Environmental issues are discussed under trade unions-employers social dialogue at the EU level in relation with their employment dimension. For example, the 2012-2014 Work Programme of European Social Partners does not consider the environment as a separate subject and in fact only touches on the issue of skills needs for green jobs. The ecological and employment crises require more opportunities for consensus, not less, as is the current trend in European institutions and in many member countries. Stakeholder consensus would put weight behind both ambitious economic recovery plans and ecological transition

With this in mind, there are different trade union proposals on the table. The EUTC, for example, places its European focus on a call for a "Sustainable New Deal". The keystone of this action is a call for a re-launch of growth policies and overcoming austerity. Growth policies will have to place priority on the green sectors.

Another example is the Confederation of German Trade Unions (DGB) which has put an ambitious program on the table focusing on conjuncture, investment and development for Europe, with a project life of ten years and to include all 27 countries of the European Union. Under the title "A Plan Marshall for Europe", German trade Unions are suggesting an investment program (260,000 million Euros annually - being approx 2% of Europe's GDP) that would change the present situation of a Europe stuck in an economic slump. The text calls for investments in sustainable energy generation, reducing energy consumption, in industry and sustainable services, in education and training, research and development, in a modern transport infrastructure, in cities and municipalities to lower levels of emissions, in government efficiency and in the appropriate level of participation of all social groups for a better future.

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Annex I: European documents definitions

REGULATORY DOCUMENTS

European Directive: European Directive is a legislative act of the European Union which requires member states to achieve a particular result without dictating the means of achieving that result.

Directives are mandatory and are hierarchically the highest level of regulation that can be imposed on EU member states. Directives occur when a decision at an EU level is used to direct member state governments what to do. Directives specify the results to be achieved and the deadline within which to achieve them, but form and methods of implementation are left at the discretion of member states.

European Regulation: European Regulations are immediately applicable and binding in all EU member states. No legislation is required at a national government level.
European Decision: EC Decisions (by European Council or Commission) apply specifically to one or more member states and are directly binding.

OTHER DOCUMENTS

Policies: Policies are high-level overall plans embracing general goals and procedures about declared objectives which a government seeks to achieve and preserve in the interest of the community.

EC Recommendation: EC Recommendation is a non-binding declaration, which has no force in law and is mainly used to assist the interpretation of other acts.

EC Communications: EC Communications usually set out a Commission action plan (may include concrete proposals for legislation).

Position Papers: Position Papers are documents not issued by EC but presenting opinion of professional organisations regarding EC documents such as EC Directives, EC communications, etc.

Green Papers are communications published by the Commission on a specific policy area. Primarily they are documents addressed to interested parties, organisations and individuals, who are invited to participate in a process of consultation and debate. In some cases they provide an impetus for subsequent legislation.

White Papers: White Papers are documents containing proposals for Community action in a specific area. They communicate a decided Commission policy or approach on a particular issue. They often follow a Green Paper published to launch a consultation process at European level. They are chiefly intended as statements of Commission policy, rather than a consultation or starting point for debate.