Sustainability **2015**, *7*, 9231-9250; doi:10.3390/su7079231

OPEN ACCESS

sustainability

ISSN 2071-1050

www.mdpi.com/journal/sustainability

Article

Employment Policies for a Green Economy at the European Union Level

Diana Mihaela Pociovălișteanu [1,†,*], Isabel Novo-Corti [2,†], Mirela Ionela Aceleanu [3,†], Andreea Claudia Șerban [3,†] and Eugenia Grecu [4,†]

1 Faculty of Economics and Business Administration, "Constantin Brâncuși" University of Târgu-Jiu, Eroilor Street, No. 30, Targu-Jiu 210135, Gorj, Romania

2 Economic Development and Social Sustainability Research Group (EDaSS), Department of Economic Analysis and Business Administration, Faculty of Economics and Business, Campus de Elviña, s/n, A Coruña 15071, Spain; E-Mail: isabel.novo.corti@udc.es

3 Faculty of Theoretical and Applied Economics, The Bucharest University of Economic Studies, Romana Square, No.6, Bucharest 010374, Romania; E-Mails: aceleanu_mirela@yahoo.com (M.I.A.); andre_serban@yahoo.com (A.C.Ș.)

4 Faculty of Management in Production and Transports, Politehnica University of Timisoara, Remus Street, No.14, Timisoara 300289, Romania; E-Mail: eugeniagrecu@yahoo.com

† These authors contributed equally to this work.

* Author to whom correspondence should be addressed; E-Mail: dianap@utgjiu.ro or diana.pociovalisteanu@gmail.com; Tel.: +40-726-187-718.

Academic Editor: Marc A. Rosen

Received: 6 May 2015 / Accepted: 10 July 2015 / Published: 15 July 2015

Abstract: Sustainable economic development requires ensuring economic growth and development in terms of environmental protection by providing a bridge between sustainable economic growth, improvement in human health, social justice, employment and environmental protection. Our paper aims to study the situation of green jobs at the European Union level and the relationship between environment and employment, by analysing the link between employment and environmental policies. It highlights the main trends recorded at the European Union level in the field of employment policy to promote green jobs for sustainable economic development. Although there is little effect from environmental policies on employment, the effects are positive, which shows that the relationship between environmental and employment policy should be continued and improved by measures taken at both the macro- and microeconomic levels.

Keywords: employment; environment; green jobs; sustainable development

1. Introduction

The fight against climate change and other environmental challenges has become a major concern worldwide, including in the EU and its Member States.

After the 1970s, the developed countries realized that their material prosperity based on the intensive use of natural resources was threatened by energy shortages caused by the oil shocks of 1973 and 1979. This awareness triggered a variety of research that studied the relationship between energy consumption, economic development based on renewable resources, and sustainable development [1].

More recently, the current financial and economic crisis, triggered in 2008, has refocused the economic growth model by exploiting new possibilities that are based on environmental and social sustainability. Thus, the crisis has created real opportunities to promote a transition to green jobs, which requires new approaches to environmental policy impact on employment [2].

Concerns for the development of green economy and green jobs have increased lately, producing a multitude of studies, reports and research in the field. These studies underline the importance of developing a green economy and show that the support and development of this kind of economy requires government involvement through long-term public policies [3,4].

These policies aim to improve energy efficiency through green technologies, improved waste management, reduced carbon dioxide emissions, use of renewable energy sources, improved production of biofuels and other environmentally friendly production systems, and improved integration of advanced materials and energy-efficient equipment in various industrial sectors [5].

Until recently, improved industrial energy efficiency was mainly based on improvement in terms of effectiveness and less on the integration of renewable energy into the production process. Therefore the identification of policies to support the development and implementation of green technologies is also becoming increasingly important both at governmental and corporate management levels.

In the specialized literature, a lot of studies examine sustainable development based on specific indicators, such as a sustainability indicator that highlights the link between economic growth and costs of economic growth in a dynamic economy [6].

Babonea and Joia show that sustainable development requires a mobilization of financial, material and human resources, to produce positive economic effects [7] and Bertinelli, Strobl and Zou draw attention to the further development of an economy, which can be based on pollution, in which case the air quality is affected as well as the welfare of future generations, or on environmentally friendly technologies that support sustainable economic development. In this way, the result of economic development depends on national investments in green technologies and the ability of the economy to innovate so that the environment is protected [8].

Thus sustainable economic development must be carried out through the development of a green economy based on energy reduction and clean energy, in order to help create green jobs. A major part of sustainable policies and employment are in energy reduction (e.g., retrofitting older buildings to

higher energy efficiency and environmental standards), which justifies the positive results achieved in this area in recent years [9].

Murga-Meneyo M.A. believes that universities are the main training centres for a sustainable economy by promoting relevant skills and must embrace their formative role not only regarding the graduates who will fill green jobs, but also regarding all the other graduates who will work in other fields, in their role as producers and consumers [10].

Horbach and Rennings analyse the environmental innovation effect on the dynamics of employment in different technology fields. Their econometric analysis shows that innovative firms are characterized by a more dynamic development of employment. In particular, the introduction of cleaner technologies as process innovations leads to a higher employment within the firm.

The explanation is that these innovative technologies generate cost savings that improve business competitiveness, which has positive implications on demand and employment [11].

Increasingly, environmental and employment issues have been followed through EU policies and strategies, creating correlations between actions and objectives regarding the improvement of employment and those aimed at environmental protection. In this respect, of major importance are the Europe 2020 strategy and the 7th Environment Action Programme (EAP) that will guide European environmental action, but also employment to 2020, as guideline for 2050.

The implementation of green jobs policies causes changes in production and the structure of employment, which means on the one hand increased production and employment in the modern and environmental sectors, and on the other hand, the decline of employment in traditional sectors. In order to avoid an increase in unemployment both environmental and employment policies should be well correlated [12].

This research identifies the European models of good practice in terms of employment and green jobs strategies and presents recommendations on how to strengthen and improve green employment in order to contribute to human welfare and sustainable development. This research has been improved by sharing ideas developed at the International Scientific Symposium, *Information Society and Sustainable Development, Second Edition, Azuga, Romania, 24–25 April 2015* [3].

2. Green Jobs—Pillar of Sustainable Economic Development

Sustainable economic development is one of the main objectives of economic policies and strategies in recent years, at the European and global levels. These concerns are based on climate and technological changes that have led to increased environmental concerns.

Society faces the need for radical change as a result of increasing technological progress and increasing environmental impact. Therefore, environmental issues must be addressed systemically to find harmony between all the subsystems of the economy [13].

The publication of the report *Our Common Future*, from the World Commission on Environment and Development in the year 1987, which was based on *United Nations Conference* regarding the environment in 1972, was the starting point for a common approach to development and environment. *The Conference in Rio de Janeiro in 1992* [14] mentioned the issue of building consensus on economic, human and environmental protection, calling into question new systems for measuring the concept of sustainable development. *The Conference in Rio de Janeiro in 2012* [15] set new

benchmarks for overcoming the difficulties related to environmental deterioration and poverty and put the spotlight on green economy and green growth.

Also, the conference examined the potential of the green economy to contribute to job growth and overcome the current financial and economic crisis.

Sustainable economic development requires ensuring economic growth and development in terms of environmental protection by providing a bridge between sustainable economic growth, improvement in human health, social justice, employment and environmental protection. The concept of sustainable development still needs to be developed from a scientific point of view to be useful in decision-making processes. In this regard, Bolis, Morioka and Sznelwar propose an approach to sustainable development that is based on three dimensions: satisfaction of human needs from a social and economic point of view, the efficient use of natural resources, and the decision-making perspective from an axiological point of view [16].

It aims to create a green economy, able to provide environmentally friendly economic development. The concept of a *green economy* is increasingly used and is used to mean an economy in which natural resources are used effectively so as to provide higher productivity, increased wealth, better jobs and social inclusion, with a consumption of energy and natural resources as low as possible.

The United Nations defines a green economy as "being that economy which results in improved human wellbeing and social equity, while significantly reducing environmental risks and ecological scarcities" [17].

According to the European Environment Agency, a green economy is characterized by three objectives: improving efficiency of resource use, ensuring ecosystem resilience and increasing social equity [18].

Green economic growth is a positive relationship between economic growth and environmental sustainability, reflected in resource-efficient growth, stimulation of innovation and adoption of green technologies, and creation of decent jobs on the economic side, which is closely related to environmental side reflected in reduction of pollution, increased efficiency in natural resources use, investments and in stability of ecosystem on the environmental side [19].

Current economic and environmental developments including the economic crisis have affected employment by reducing aggregate demand, as well as the negative effects of pollution and the degradation of the environment and natural resources on agriculture, fishing and tourism. In this context, economic policies at both the micro- and macroeconomic levels, employment policies and education policies become increasingly important, especially since sustainable development is boosted by training individuals for green jobs and by creating such jobs.

The concept of *green jobs* covers "all jobs that depend on the environment or are created, substituted or redefined in the transition process towards a greener economy" [20].

ILO considers green jobs those that contribute to ensuring environmental sustainability and conservation [21]. These jobs involve reducing energy consumption, limiting greenhouse gas emissions and effects, reducing pollution and protecting the ecosystems [22].

Eurostat defines green jobs as part of the objective to better manage resources in environmental protection conditions. Eurostat categorizes an activity as an ecological activity when at least 50% of the time required to complete it involves a good or service that protects the environment.

The International Institute for Labour Studies believes that green jobs are those jobs maintained or created in the transition process towards a green economy [23].

The Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World report shows that employment will be influenced by the increasing role of sustainable development in macroeconomic policies, in the following respects:

- the newly created jobs must comply with the conditions in terms of pollution, which must be minimized;
- it plays an important role by making the traditional jobs green jobs, by using renewable energy, by retraining workers and by greening the working methods;
- employment being given up in heavily polluted areas [24].

However, sustainable economic development is based on creating green jobs that will require green manufacturing and service activities, which will influence the behaviour of economic agents, both as producers and consumers. Investments in green areas will lead to the expansion of green production and the direct creation of green jobs. Expanded production invariably leads to a higher demand for inputs, resulting in an indirect increase in jobs in supplier industries. Increased consumer spending as a result of jobs created directly and indirectly will also generate jobs. Thus, more green jobs mean a cleaner environment, a better quality of life and green economic growth, all supporting sustainable development.

Even though there are many definitions of green jobs, there are still problems in determining very specific criteria for identifying these jobs. For example, does the bus driver perform a green activity because of the fact that travelling by bus is more sustainable than travelling by car, or can this job only be considered green if the bus uses bio-fuel? [25].

The identification of green jobs according to the literature can be done in areas such as:

- renewable energy, which creates more jobs than the traditional energy sector,
- the construction sector, which involves improving the methods and materials of construction, heating, and ventilation, so as to increase energy efficiency,
- the transport sector, which requires a large consumption of fossil fuels and requires a switch to other sources of energy/fuel,
- the recycling sector, which can reduce energy consumption and pollution by recycling materials such as paper, iron, steel, and aluminium;
- the agricultural sector, which can contribute to the creation of green jobs through the development of organic farming.

Green jobs, along with the greening of production and consumption, contribute to achieving green economic growth, which also means an increase in the well-being and quality of life for present and future generations.

Green activities involve greater care for the environment and will cause economic agents to change their behaviour, production and consumption. In this way they will lay the foundations for green economic growth as a result of increased environmentally friendly activities. This also means an increase in well-being and quality of life by living in a clean, healthy and productive environment. All these will help ensure sustainable economic development that will propel economies on a

sustainable growth path. This relationship between green jobs, green economy and sustainable economic development is shown schematically in Figure 1.

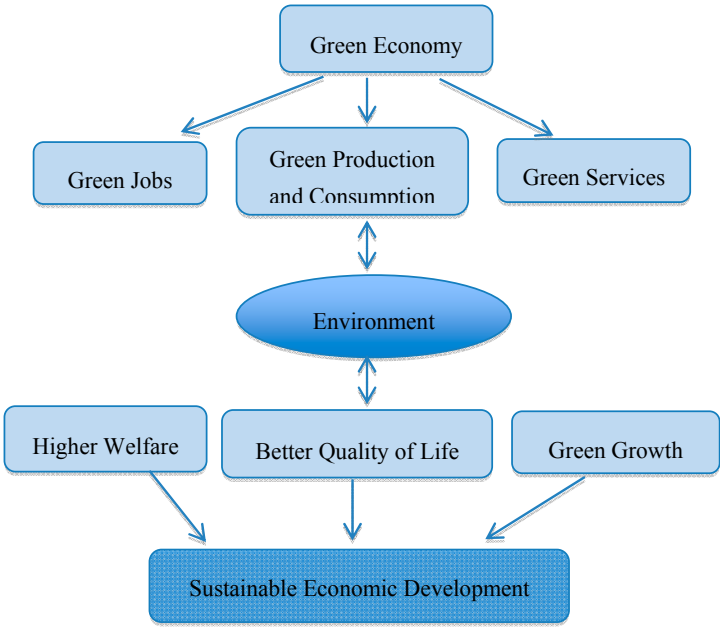

Figure 1. Conditions of ensuring sustainable economic development. Source: The contribution of authors based on literature.

The transition to green economy offers significant opportunities to create jobs, but also leads to some challenges, especially in certain areas and for certain workers.

The number of jobs created in all stages of greening the economy depends on many factors, such as investment size, the extent of demand for organic products, employment elasticity, and the cost of green products and services for consumers.

Green employment of labour depends on a stable environment, on the health of ecosystems and measures taken in time through large-scale investment in new technologies, equipment, buildings and infrastructure [24]. Policies aimed at creating green jobs must take into account not only the direct creation of such jobs, but also indirect jobs that can be created in adjacent industries. Also, any employment policy must take into account the net number of jobs created, *i.e.*, the difference between jobs created by the transition to the green economy and potential job losses. The multiplication effect for jobs created through the transition to green economy will generate certain changes in employment, different from one domain to another. There will be areas where employment growth will occur both through transforming traditional jobs into green jobs, and by creating new green jobs, or other areas that will completely lose some jobs. These changes may require retraining of staff or displacement of workforce to other areas/regions, with major implications on the workforce structure. Therefore, employment policies with educational policies need to aim to create the right skills for the new demands of the green economy.

3. Green Jobs in the European Union

At the EU level, environmental concerns arose in 1972–1973 when the first Environmental Action Programme was developed. However, environmental policy acquired legal basis in the Single European Act in 1987, when the subsidiarity principle was used for the first time at the EU level, then taken as the operating rule of the European Union by the Maastricht Treaty. Therefore, for decisions relating to the environment, the level of intervention is the community level, if it could work more efficiently than the Member States could. In 2000, the Lisbon Strategy recognized the importance of environmental objectives for making the EU the most dynamic and competitive economy in the world and understood the need for close cooperation between EU countries. However, the structure of the objectives was too complex, even after the relaunch in 2005, so that the objectives were reviewed in 2010 and the Europe 2020 Strategy was left with fewer and clearer objectives. One of the objectives of this new strategy is turning the EU into a sustainable economy by promoting a more efficient use of resources and energy, aspects included in the climate and environmental change objective [26]. It aims for three numerical targets: the growth of renewable energy sources and energy efficiency and reduced emissions of greenhouse gases (this objective can be achieved either through the use of clean energy—wind, solar, or photovoltaic energy—or reducing polluting energy). The aim is that by 2020, they will develop a green economy based partly on the use (and hence production) of renewable energy and secondly on reducing greenhouse gas emissions and increasing energy efficiency (e.g., by saving energy and the introduction of minimum energy efficiency standards for various equipment, improving the energy performance of construction) [27].

All these bring changes at the level of European employment policies, which are becoming increasingly concerned with the creation of green jobs. The employment package launched in 2012 recognizes the need to synchronize employment policies with other areas of public policy to ensure economic development and identify the transition to a green economy as an important source of new jobs in the European Union. It is estimated that this transition to a green economy will initially have beneficial effects particularly for the highly skilled workers, but subsequently, as green manufacturing and services generalize, there will be jobs for those with intermediate skills. Labour markets and national governments will be able to support in particular low-skilled and older workers in adapting to new competencies. In addition, green jobs will have a regional impact differently from regular jobs, which will require the attention of authorities for understanding and managing supply and demand of skills in different areas [28].

The exact number of green jobs is hard to know, primarily due to the differences in the definition of this concept and, secondly, due to the weight of quantifying these activities in several European countries. Some European countries are concerned about green employment, but they are in the beginning of implementing green policies, which makes the quantification of this process difficult to achieve.

According to data provided by the European Commission, Austria had approximately 163,000 green jobs in 2008, with growth potential between 50,000 and 70,000 green jobs by 2020. Finland estimated the existence of 5888 green jobs in 2009, and France estimated that green jobs accounted for 1.6% of total employment in 2010. Germany recorded a green occupancy level of 4.5% of total employment in 2006 and has estimated by the year 2020 that it will reach 500,000 green jobs in renewable energy. The analysis of data provided by the European Commission observed that

organizations which assess the number of green jobs have different methods and usually have data only for certain fields (renewable energy, construction, transport, forestry, *etc.*) making it difficult to conduct a comparative analysis by country [29].

There are areas where quantification of green jobs is easier to achieve; these are areas that have been created in recent years on green economy principles. These areas are renewable energy, organic farming, green tourism, forestry, and production of green goods and services.

Green jobs can be analysed in the field of energy (whose priority is reducing energy consumption and creating clean energy) in the field of environmental pollution (whose priority is clean air, water and earth) and in the field of recycling and reducing consumption of materials/resources. Given that about 3 billion tonnes of waste are generated annually in the EU (over 6 tonnes per European citizen per year), EU environmental policies pay special attention to recycling issues. In the area of recycling employment increased by 45% in 2000–2007, and the European Commission estimates the creation of 580,000 new jobs in the coming period in this field. At the same time, the European Commission believes that there will be between 10,000 and 20,000 new jobs created, an increase of 1% in the rate of growth of the water industry [30,31].

The importance of energetic sustainability is widely debated worldwide and requires the acquisition of energetic efficiency and use of renewable energy, due to the reduction in energy consumption [32].

According to reports, green jobs have grown in recent years, particularly in the energy sector. As a result, renewable energy sources now employ around 5 million workers, more than double the number of employees from a few years ago [33].

Jobs in renewable energy 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 machines to manufacture wind-turbines [34].

The report "The State of Renewable Energies in Europe" captures employment in the renewable energy sector, which is a good barometer for the expansion of green jobs. Even if this sector is not the only area where green jobs have grown, it has the highest rate of employment compared to the other sectors that create green jobs [35].

The financial and economic crisis affected this area in terms of jobs created, which made employment in renewable energy to slightly decrease in 2012, when employment in renewable energy activities represented around 1.2 million jobs.

Countries with the best results in employment (as total jobs) in activities in the renewable energy sector (2013) are: Germany, France and the United Kingdom. At the opposite pole are Malta and Cyprus. There are major differences between the countries at the top, Germany, France and the United Kingdom, where over 100,000 jobs were created, over 1% of total employment in those countries, and Malta and Cyprus, where less than 1000 jobs were created, representing 0,1% of total employment. At the EU level, the main areas that have registered the most jobs in most European countries are wind power, solid biomass and photovoltaic.

There are differences between the fields of renewable energy which have created more jobs in the EU. For example, Germany, Italy and Denmark excel in wind power; Germany, France, Sweden in the solid biomass area, in the fields of photovoltaic; solar thermal and biofuels, Germany and France; in the field of geothermal energy, Italy and Germany. These values show the result of EU member

countries' concerns in the field of creating green jobs. Overall, green jobs created in renewable energy have increased, even if they have been affected in recent years by the economic and financial crisis, which shows that European concerns for developing this area have been increasing.

In the period 2011–2012, Germany recorded the best results of the EU countries, both in terms of market size and creation of jobs related to renewable sources. Germany had the advantage of a number of jobs two times greater than France's and over three times that of Italy. However, in recent years Germany, along with Denmark, has occupied the top spots of the global green economy index, calculated by the organization Dual Citizen. This index combines in its analysis the national green performance with perception of that performance [36].

If we analyse employment in renewable energy at the EU level, by subdomains, we see that wind power, solid biomass and the photovoltaic sector have the largest share in total employment (Figure 2).

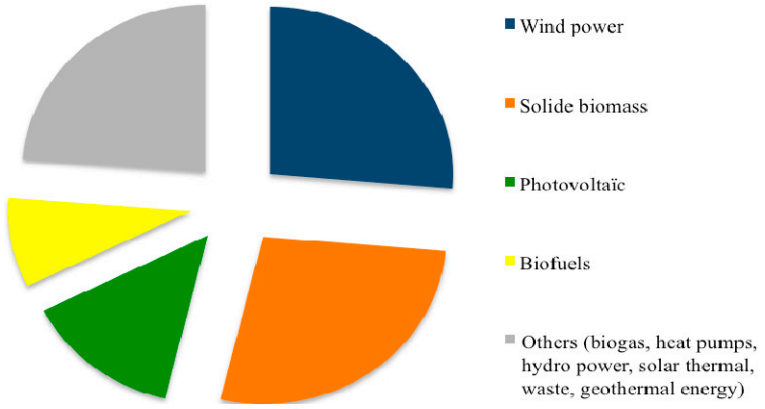

Figure 2. Employment in the field of renewable energy by subdomains, EU, 2013. Source: The State of Renewable Energies in Europe, Eurobserver Report, 2014 [35].

Business in the wind energy sector slightly increased in 2012 at the EU level and registered the highest number of jobs in the renewable energy field, *i.e.*, 303,445 jobs. In 2013 employment in this sector declined slightly and the number of jobs dropped to 302,450.

The biomass sub-sector plays an important role in the development of business environment at the EU level, creating revenue opportunities and green jobs in forestry, machinery production, wood processing and the energy industry. Biomass has turned and strengthened its position as top sector in the socioeconomic aspects. In 2011–2013 all EU Member States increased biomass-based energy production and the number of jobs in the sector was 314,800.

The photovoltaic sector suffered from the economic and financial crisis which has made investments in this area decline in recent years.

The financial and economic crisis influenced the entire renewable energy sector by reducing investments and projects undertaken during this period, which also influenced employment in this field.

Regarding forecasts for the period 2030–2050, the study "A 100% Renewable Energy Vision for the European Union" sets reaching the percentage of 100% renewable in the energy sector as its target for 2050. This percentage would correspond to the creation of 6.1 million jobs, which means an average annual increase by 36% of employment in the sector [37].

A study conducted by Institute of Development Studies-UK (2011) [38] estimates that in the next period (2014–2020) 14% of the EU budget would be invested in renewable energies, environmental

conservation, energy savings in buildings and sustainable transport. More than half a million jobs would be created.

The share of employment in the renewable energy sector in total employment in the EU shows an increase in these jobs in the last decade. Countries that achieved the best results on this indicator in 2012 are Denmark, Finland, Sweden and Austria, which invested more in renewable energy, even if the effects of the current financial and economic crisis have been felt in all EU countries. In 2013, these countries remained in the top positions. Countries with the lowest results for 2012 were Malta, the UK and Romania, and for 2013 were Malta, Cyprus and Slovakia (Figure 3). These countries have reduced investments in recent years in the area of renewable energy development because of the financial and economic crisis.

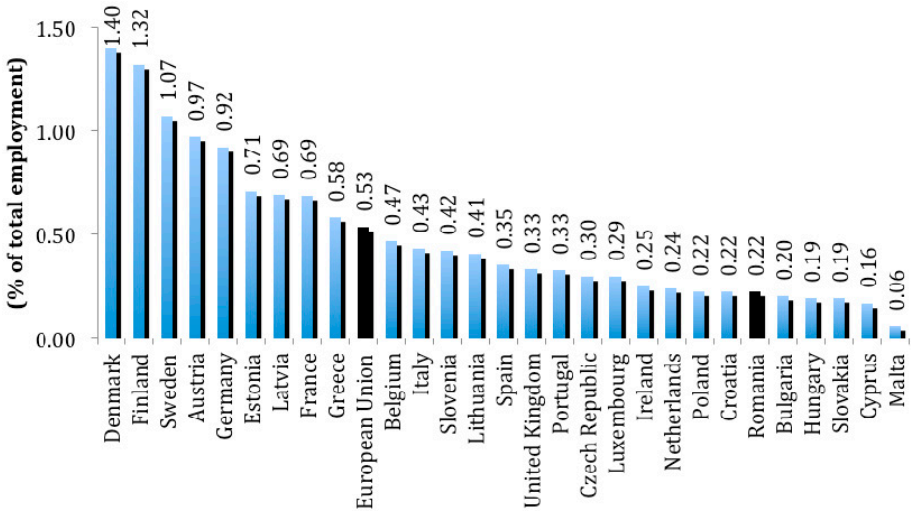

Figure 3. Employment in the renewable energy sector as % share of total employment (15–64 years), 2013. Source: Based on the data provided by the report "The State of Renewable Energies in Europe", Eurobserver Report, 2014 & Eurostat Statistics, (lfsi_emp_a) [35,39].

Green jobs extend beyond the renewable energy sector, such as green jobs in organic farming, green tourism and forestry. Some green jobs are less visible, but they contribute to improving the environmental performance. According to the study "EU environment policy supporting jobs and growth", about 5.6 million people are directly employed in jobs related to the environment. There are jobs that are indirectly related to the environment, and taking into account this broad approach, one in ten jobs in Europe depends to some extent on the environment [40].

For example, environmental goods and services include activities that generate environmental products, *i.e.*, products that have been produced for the purpose of environmental protection or resource management. Employment in this sector increased by about 37% from 2002 to 2011. In 2012 about 4.2 million people were employed full-time in this sector. Resource management activities, which include activities of conservation and maintenance of the stock of natural resources, have contributed the most in this sector to increase employment [41].

These positive developments were followed by a decline in terms of creating green jobs in the EU and even worldwide in the period 2013–2015. The decline was mainly in renewable energy, a field

which experienced the greatest boom. The International Renewable Energy Agency estimates that globally, 6.5 million people worked in the renewable energy sector in 2013, a decrease compared to the previous years. In the EU the greatest decline is recorded in the field of wind and solar energy. Although Germany, France, Italy and Spain still hold 60% of all green jobs, in the field of renewable energy, Germany remains the dominant force in Europe [42].

Even if environmental policies follow their course, it seems that the effectiveness of their implementation depends on several factors. The recent decline recorded in the evolution of green economy development and green job creation can be explained by: public policies applied in recent years, which reduced tariff subsidies to support investment in renewable energy (especially wind and solar); low investment in the sector, following the reduction of economic growth, of implementing austerity measures and of hardening lending to investors in the field; and in some countries, great support for companies producing dirty energy. Also, the political context is important because uncertainty and frequent changes at the political level are inimical to supporting investment and sustainable development. Furthermore, skill deficit may also act as a major barrier to implementing renewable energy policies and, therefore, for creating jobs in the field.

4. Employment Policy to Promote Green Jobs at the EU Level

Employment policies are governmental measures aimed at labour market intervention to stimulate job creation and efficient functioning of the labour market in the conditions of market economy. A green economy requires occupational policies that take into account the environmental policy in order to promote the creation of green jobs and the transformation of existing jobs into green jobs.

In the present context, the European economies have been affected by the crisis, triggered in 2008, and the European Commission has set the development of the green economy as a strategic area for the coming years. Green employment policies can play an important role in overcoming the recession, while helping the transition to a low-carbon and resource-efficient economy.

The creation of green jobs is part of the overall strategy of the European Union in dealing with the crisis on its way to transform the economies to promote sustainable and inclusive growth [43].

Studies conducted by OECD, Eurostat and UNEP show that there is a positive effect of investments in environmental activities on creating jobs.

Green jobs can be part either of the eco-industry category, including jobs that are green by the nature of the activity, or of the transformation category, in which all jobs can become green. It has been recognised that the transition to a greener economy is a dynamic process of transformation capable of affecting the quantity and nature of work and skill needs across all sectors and occupations.

The European Commission has established four courses of action to promote green employment policies and the creation of green jobs:

- introduction of green employment policies in national strategies
- training skills needed in a green economy
- use of financial instruments for smart green investments
- creation of partnerships between labour market actors [20]

To support the creation of green jobs and the transformation of the existing ones into green jobs, efforts must be made both at the organizational and governmental levels. Both companies and the government can support green jobs through projects, development of new technologies, supporting the production of green products and training to create the necessary skills for a green economy. Education and training also contribute to the development of green jobs, increase labour productivity and thus ensure sustainable development [4].

Moving towards a greener economy which increasingly uses natural resources requires a change in the business environment and labour market. Like any structural change, the success of the transition to a green economy will depend on how the skills and entrepreneurial abilities adapt to market demands, on the spread of new technologies and on the ability of labour market policies to support workers and employers in achieving this transition.

Overall, the positive effects of the transition to the green economy can be explained by the need for relatively more labour per unit of production in low-carbon industry, compared to the traditional economy, making the number of jobs gained through the transition to the green economy compensate for the loss of jobs in the traditional sectors [44].

The creation of green jobs is higher in sectors such as renewable energy, research and innovation, and information and communication technology. Regarding labour intensity, it is found that green industries (solar panel) tend to be similar or relatively more labour-intensive in comparison to fossil fuel jobs (coal mining), which are more heavily mechanized. Jobs in traditional building construction, for example, tend to have similar work intensity comparing to the new replacement sector, energy-efficient building construction [45].

Although an increase in the number of green jobs is expected in order to compensate for traditional job losses, the skills required for the new green jobs are not necessarily the same as those used in the workplaces in the polluting activities. The success of this transition towards green jobs is based on retraining workers by acquiring the necessary skills. Therefore, skill policies must be correlated with environmental policies [46,47].

Greening the economy offers the possibility of creating new jobs and fighting against unemployment while combating environmental degradation. This development will change the characteristics of the labour market in terms of supply and demand, which increases the need to equip the workforce with relevant qualifications so as to be prepared to meet the conditions of the new green jobs. A mismatch between labour demand and supply can negatively affect the process of greening the economy.

In order to achieve a better match between the skills of the workforce and green labour market requirements, the EU expanded the measures aimed at better preparing the workforce for the new skills in the fields of green economy, supporting programmes to create green jobs and supporting collaboration between the academic and private sector.

Some countries, such as Belgium, Greece, Poland, and Portugal, have recognized the potential of the green economy as a source of jobs for the unemployed and have developed vocational training courses in green skills.

For the period after 2020, it is possible that the number of green jobs will grow at a slower pace, as major investment in renewable areas is expected to be completed by 2020. Moreover, the sectors that will benefit most from the transition to the green economy are: renewable energy, conventional power

generation, cement, carbon capture and storage, iron and steel, machinery and electrical equipment, constructions and transportation [48].

Employment policies that promote the creation of green jobs must cover two lines of action:

- Firstly, green economy growth policies integrating employment policies must be created.
- Secondly, occupational policies should support green growth.

At the EU level many countries have made progress and developed a relationship between environmental policies and economic growth policies and occupational ones (such as Austria, France, Finland, and Iceland). However, there are still countries (such as Latvia, Lithuania, Czech Republic, and Slovenia) addressing the issue of greening the economy separately from jobs. Thus, environmental policies do not recognize the potential of creating jobs, while labour market policies do not see the green economy as a potential source of job creation.

Some countries set environmental policies without referring to green jobs as the main objective of greening policies (Germany, Italy, The Netherlands, Norway, Hungary, Croatia and the UK). These policies relate to renewable energy, the efficient use of resources and climate changes.

According to OECD reports, it is interesting to note that some countries (Germany, the Netherlands, Sweden and Norway) which are at an advanced level in terms of the introduction of measures to reduce carbon emissions have developed labour market programmes aimed specifically at green growth. In such situations the creation of jobs is seen as an indirect consequence of green growth policies [49].

In recent years, many European countries have reconsidered their position regarding the direct relationship between green economy and creating new jobs, developing links between environmental and employment policies (Denmark, Sweden, Germany, Norway, Slovakia and Belgium).

The current economic crisis has led in some countries to be less concerned about the development of green jobs. For example, in Belgium the crisis and the need to reduce the public debt have forced the federal and regional authorities to reduce their support for the greening of the economy. In Spain, Italy, Latvia and Slovenia the crisis has led to a reduction in funding for environmental strategies and policies to reduce the national deficit and solve the problems of unemployment [29].

For the next period, at the EU level, more measures, policies and strategies to promote green jobs are being pursued in the context of ensuring sustainable economic growth. The main measures concern the following aspects:

- *development of educational programmes and training* to support greener economies;
- *shifts in taxation*, by increasing taxes to discourage the production and consumption of environmentally harmful goods and services and by applying tax exemptions to encourage green activities;
- *supporting by subsidizing the development and use of environmental technologies*, in more and more areas and building research networks, to promote knowledge transfer between universities, research centres, and public and private sectors.
- *promoting the adoption of green technologies among consumers/households*, by promoting energetic efficiency and renewable energy use at the individual consumer level;
- *investments in green infrastructure* and adaptation to climate changes;
- *promoting green economy at social level*, through increased awareness of the benefits of green economy [29,50,51].

Certainly employment, decent work and social inclusion must be part of any sustainable development strategy. This requires that labour market policies should focus on active measures and on the development of skills necessary for the green economy, which involves educational policies to facilitate the transition to green jobs and improve employment opportunities.

The scientific literature has shown that labour market performances can be affected by many factors and their impact could be different from country to country, or from one region to another. These factors could be: demographic changes, structural factors (like the share of population employed in different economic branches), economic policies, business cycle, economic development, the efficiency of the correlation between employment policies and other policies (environment policies, educational policies, fiscal policies) [52].

Even though in recent years concerns about environmental protection have grown, environmental degradation is still present in Europe, and there is still a negative impact on the environment and on current economic growth. Therefore, through environmental policies, attempts are being made to use resources more efficiently and to create new jobs through the application of new environmental technologies.

However, the challenges facing the EU in relation to environmental policies include increasing competition for resources; polluting technologies still being used; rising energy needs; inefficient government of environmental policies; insufficient public education regarding environmental protection in some European countries; declining investment in the field, especially due to lower tariff subsidies; and difficult credit conditions for investors. All this hampers the results of environmental programs and policies adopted at European level, especially in the countries facing economic and social problems.

The effectiveness of environmental policies does not solely depend on the legal framework or environmental action programs developed at the European level. It is also the responsibility of decision makers at the national level to educate the population with regard to compliance with the environment, and provide environmentally friendly entrepreneurship education so that actions can be linked and coordinated at the microeconomic and macroeconomic level.

The European Union report, *The European Environment—State and outlook 2015*, stresses the importance of environmental protection to be applied across all the economic fields and draws attention to the need for review of EU strategies related to the environment, so as to ensure the welfare and prosperity of humanity. Although this report shows that the European policies aimed at the environment brought positive results to the economy and quality of life, clean air and water, better waste recycling, and the creation of green jobs, the report's authors point out that Europe's long-term objectives regarding the environment are too ambitious and cannot be achieved under current environmental policies [53]. Achieving the targets set by environmental policies for the coming years requires a complex process involving profound changes in the lifestyle of many people, in the technologies used, in institutional management, and in ways of thinking.

Another limitation of environmental policies is that they aim for the long term and have visible benefits particularly in the long term, making them less attractive to the agenda of certain policy makers who seek to gain immediate results. On the other hand, a long-term policy can achieve its objectives insofar as these long-term goals are related to the short- and medium-term objectives and actions. Achieving these objectives depends, however, on the technological, demographic and climate changes that will influence Europe's ability to tackle challenges and uncertainties related to the

environment. Therefore, environmental policies and strategies should take into account the European realities and rethink the systems of production and consumption, which should be based not only on the principle of efficiency, but also on the principle of protection of natural systems.

5. Conclusions

Creating a green economy requires, in addition to government efforts to implement sound macroeconomic policies, the promotion and implementation of green production processes at the firm level and changing consumer behaviour at the individual level. Therefore, enterprises have an important role in supporting the green economy through measures such as energy and resource efficiency, low-waste, low-carbon and non-pollution. However, changing consumption patterns helps promote the green economy by increasing demand for green products.

The implementation of measures to positively influence green employment must be based on the following:

- *Access to European funding*, for infrastructure development to create public-private partnerships at the national or regional level, for workforce training and for creation of green jobs. This measure has been a key source of green job creation in countries such as Belgium, Germany, Lithuania, Luxembourg, Hungary, Portugal, Poland, Romania and Serbia.
- *An integrated policy approach to environmental and employment issues*, by developing a legal framework of development and implementation of environmental and occupational policies, creating links between environment and employment, with the main aim of ensuring environmental protection and green growth and employment by supporting public investment/grant of activities involving the creation of jobs in green industries. A good relationship between environmental and occupational policies has been established in countries such as France, Luxembourg, Malta, Austria and Poland where environmental policies have been accompanied by measures to improve skills in the green economy, green economic growth being considered an important factor in generating new jobs.
- *Identification and implementation of training needs of the workforce in line with green employer requirements,* in the long term by establishing a national strategy for green jobs training, addressing the needs of green employers at local, regional and national level to connect educational programmes with green economy requirements. Extensive concerns in this regard have occurred in Finland and Poland, which have developed studies and research aimed at ensuring sustainable economic growth, welfare and environmental protection, in the long term, in the context of creating green jobs and workforce training in an appropriate manner.
- *Cooperation between different actors*, such as governments, business associations, trade unions, and businesspeople, helps increase awareness of environmental issues and helps establish successful partnerships in creating green jobs. Models of good practice in this respect are Germany, Poland, Slovakia, Finland, Sweden and the United Kingdom, which have developed strong relationships between social partners, trade union activities and political commitment in the co-ordination of green economy initiatives.
- *Focus on sectors with potential for creating green jobs* by developing customized training programmes and by developing public-private partnerships. Countries such as Estonia,

Luxembourg, Malta and Austria have achieved good results by encouraging and supporting potential sectors in developing green jobs and environmental activities (for example, eco-construction sector, renewable energy).

Factors like access to European funding, training of the workforce in line with green employer requirements, and development of sectors with potential for creating green jobs contribute to the development of green economy and improve employment, but, as stated above, addressing this link between environment and employment is quite different in Europe. Some countries recognize more than others the fact that the green economy is a strategic area for economic growth and creation of jobs. However, EU studies show that, although there is little effect from environmental policies on employment, it is still positive, which shows that the relationship between environmental and employment policy should be maintained and improved.

The decline recorded recently in the creation of green jobs in the EU shows that the efficiency of environmental policies depends heavily on policy makers to support its implementation, as well as the economic, political and social framework in every economy. These policies and strategies should be maintained and improved to ensure sustainable economic growth and better quality of life for present and future generations.

Author Contributions

All authors contributed equally to this work. Diana Mihaela Pociovălișteanu and Isabel Novo-Corti have designed the research and conclusions. Mirela Ionela Aceleanu and Eugenia Grecu performed research and analyzed the data. Andreea Claudia Șerban has made the literature review and performed the paper editing All authors read and approved the final manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

References

1. Esseghir, A.; Khouni, L.H. Economic growth, energy consumption and sustainable development: The case of the union for the Mediterranean countries. *Energy J.* **2014**, *71*, 218–225.
2. Tosovska, E. Green growth strategy and the labour market. *Ekon. Cas*. **2011**, *59*, 987–1004.
3. Aceleanu, M.I.; Pociovalisteanu, D.M.; Serban, A.C.; Grecu, E. The link between environment and employment for a sustainable development. In Proceedings of the International Scientific Symposium, Information Society and Sustainable Development, Azuga, Romania, 24–25 April 2015.
4. Aceleanu, M.I.; Grecu, E. Green jobs in the actual employment policies for a sustainable economic development. In Proceedings of the Energy and Environment Knowledge Week, Toledo, Spain, 30–31 October 2014; pp. 203–205.
5. Dovi, V.G.; Friedler, F.; Huisingh, D.; Klemes, J.J. Cleaner energy for sustainable future. *J. Clean. Prod.* **2009**, *17*, 889–895.
6. Cairns, R.D.; Martinet, V. An Environmental-economic measure of sustainable development. *Eur. Econ. Rev.* **2014**, *69*, 4–17.

7. Babonea, A.M.; Joia, R.M. Transition to a green economy—A challenge and a solution for the world economy in multiple crisis context. *Theor. Appl. Econ. J.* **2012**, *10*, 90–101.
8. Bertinelli, L.; Strobl, E.; Zou, B. Sustainable economic development and the environment: Theory and evidence. *Energy Econ.* **2014**, *34*, 1105–1114.
9. Chapple, K.; Kroll, C.; Lester, T.W.; Montero, S. Innovation in the green economy: An extension of regional innovation system model? *Econ. Dev. Q.* **2011**, *25*, 5–25.
10. Murga-Meneyo, M.A. Learning for a sustainable economy: Teaching of green competencies in the university. *Sustainability* **2014**, *6*, 2974–2992.
11. Horbach, J.; Rennings, K. Environmental innovation and employment dynamics in different technology fields—An analysis based on the German community innovation survey 2009. *J. Clean. Prod.* **2013**, *57*, 158–165.
12. Rosiek, J.; Tarnawska, K. The impact of European Union green jobs policy on structural changes in EU economies. In Proceedings of the 5th International Technology, Education and Development Conference, Valencia, Spain, 7–9 March 2011; pp. 865–874.
13. Burskyte, V.; Belous, O.; Stasiskiene, Z. Sustainable development of deep-water seaport: The case of Lithuania. *Environ. Sci. Pollut. Res.* **2011**, *18*, 716–726.
14. United Nations. The Rio Declaration on Environment and Development. In Proceedings of The United Nations Conference on Environment and Development, Rio de Janeiro, Brasil, 3–14 June 1992.
15. United Nations. Rio 20+. In Proceedings of The United Nations Conference on Sustainable Development, Rio+20, Rio de Janeiro, Brasil, 20–22 June 2012.
16. Bolis, I.; Morioka, N.; Sznelwar, I.L. When sustainable development risks losing its meaning. Delimiting the concept with a comprehensive literature review and a conceptual model. *J. Clean. Prod.* **2014**, *83*, 7–20.
17. United Nations Environment Programme (UNEP). Towards a Green Economy: Pathways to Sustainable Development and Poverty Eradication. Available online: http://sustainabledevelopment.un.org/index.php?page=view&type=400&nr=126&menu=35 (accessed on 17 January 2015).
18. EEA (European Environment Agency). *Resource-efficient Green Economy and EU Policies*; EEA Report No 2/2014; Publications Office of the European Union: Luxembourg, 2014.
19. Poverty Environment Partnership. Building an inclusive green economy for all: Opportunities and challenges for overcoming poverty and inequality. In Proceedings of the 17th Poverty Environment Partnership, Orchha, India, 6–9 February 2012.
20. European Commission. Green Jobs: Employment Potential and Challenges. Available online: http://www.docstoc.com/docs/156659726/green-jobs---European-Commission---Europa (accessed on 10 January 2015).
21. International Labour Organization (ILO). What is a Green Jobs? Available online: http://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang--en/index.htm (accessed on 14 December 2014).

22. Global Green Growth Institute; Organisation for Economic Co-operation and Development; United Nations Environment Programme; World Bank. Moving towards a Common Approach on Green Growth Indicators. Available online: http://www.greengrowthknowledge.org/resource/moving-towards-common-approach-green-growth-indicators (accessed on 14 December 2014).
23. International Labour Organization; European Union & International Institute for Labour Studies. Defining "Green": Issues and Considerations. Available online: http://www.ilo.org/inst/research/addressing-crisis-challenges/discussion-paper-series/WCMS_194180/lang--en/index.htm (accessed on 17 January 2015).
24. United Nations Environment Programme; International Labour Organization; International Organisation of Employers and International Trade Union Confederation. Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World. Available online: http://www.unep.org/PDF/UNEPGreenJobs_report08.pdf (accessed on 14 December 2014).
25. International Labour Organization (ILO). Methodologies for Assessing Green Jobs. Available online: http://www.ilo.org/greenjobs (accessed on 14 December 2014).
26. European Commission. Europa 2020 Strategy—Resume. Available online: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:ro:PDF (accessed on 17 June 2015).
27. European Commission. An Energy Policy for Europe. Available online: http://europa.eu/legislation_summaries/energy/european_energy_policy/l27067_ro.htm (accessed on 19 June 2015).
28. European Commission. Towards a Job Rich Recovery. Available online: http://eur-lex.europa.eu/legal-content/RO/TXT/PDF/?uri=CELEX:52012DC0173&from=EN (accessed on 19 June 2015).
29. Cox, A; Foley, B. *Public Employment Services and Green Jobs*; Analytical Paper; Institute for Employment Studies: Brighton, UK, 2013.
30. EEA (European Environment Agency). Well-being and the Environment, Luxembourg: Publications Office of the European Union. Available online: http://www.eea.europa.eu/publications/signals-2014 (accessed on 23 June 2015).
31. European Comission. Green Employment Initiative to Support Structural Shift to Green Growth by Maximising Job Opportunities. Available online: http://europa.eu/rapid/press-release_MEMO-14-446_en.htm (accessed on 23 June 2015).
32. Mihic, M.M.; Petrovic, D.C.; Vuckovic, A.M. Comparative analysis of global trends in energy sustainability. *Environ. Eng. Manag. J.* **2014**, *13*, 947–960.
33. International Labour Organization (ILO). Working Towards Sustainable Development. Opportunities for Decent Work and Social Inclusion in a Green Economy. Available online: http://www.ilo.org/publns (accessed on 17 December 2014).
34. European Union. Green Jobs and Related Policy Frameworks: An Overview of the European Union. 2013. Available online: http://www.sustainlabour.org/documentos/Green%20and%20decent%20jobs-%20An%20Overview%20from%20Europe%20FINAL.pdf (accessed on 10 January 2015).
35. Eurobserver. The State of Renewable Energies in Europe. Available online: http://observer.cartajour-online.com/Interface_Fondem/css/picture_libs/barobilan13-gb.pdf (accessed on 4 February 2015).

36. Dual Citizen. The 2012 Global Green Economy Index—An Analytic Tool Measuring National Green Reputations and Performance. Available online: http://www.dualcitizeninc.com/ggei2012.pdf (accessed on 4 February 2015).
37. European Renewable Energy Council (EREC). *Rethinking 2050: A 100% Renewable Energy Vision for the European Union*; EREC: Brussels, Belgium, 2010.
38. Institute of Development Studies; Institute for Employment Research. *Studies on Sustainability Issues—Green Jobs; Trade and Labour*; Cambridge Econometrics: Cambridge, UK, 2011.
39. European Commission. Eurostat Statistics 2015. Available online: http://ec.europa.eu/eurostat/en/web/products-datasets/-/LFSI_EMP_A (accessed on 4 February 2015).
40. European Commission. *EU Environment Policy Supporting Jobs and Growth*; Publications Office of the European Union: Luxembourg, 2011.
41. Eurostat. *2013 Monitoring Report of the EU Sustainable Development Strategy*; Publications Office of the European Union: Luxembourg, 2013.
42. The International Renewable Energy Agency (IRENA). Renewable Energy and Jobs, Annual Review, 2014. Available online: http://www.irena.org/Publications/rejobs-annual-review-2014.pdf (accessed on 24 June 2015).
43. European Commission. Inteligent Energy Europe Programme. Available online: https://ec.europa.eu/energy/intelligent/about/iee-programme/ (accessed on 20 January 2015).
44. International Labour Organization (ILO). *Towards a Greener Economy: The Social Dimensions, European Commission*; International Institute for Labour Studies of the International Labour Organisation: Geneva, Switzerland, 2011.
45. Gracey, K.; Davidson, M. Green Jobs for Youth, 2012. Available online: http://switchboard.nrdc.org/blogs/mdavidson/YouthGreenJobs%20-%20Gracey,%20Davidson.pdf (accessed on 24 January 2015).
46. International Labour Organization (ILO). Evidence of Positive Employment Effects from Green Policies, Working towards Sustainable Development. Available online: http://www.ilo.org/publns (accessed on 24 January 2015).
47. International Labour Organization (ILO). *A Skilled Workforce for Strong, Sustainable and Balanced Growth: A G20 Training Strategy*; International Labour Office: Geneva, Switzerland, 2010.
48. European Commission. *Renewable Energy: Progressing towards the 2020 Target*; Communication from the European Commission: Brussels, Belgium, 2011.
49. Organization for Economic Co-operation and Development (OECD). *The Jobs Potential of a Shift towards a Low-Carbon Economy: Final Report for the European Commission*; OECD: Paris, France, 2012.
50. European Commission. *Exploiting the Employment Potential of Green Growth, SWD 92*; European Commission: Strasbourg, France, 2012.
51. Cedefop. *Skills for Green Jobs, European Synthesis Report*; Publications Office of the European Union: Luxembourg, 2010.

52. Dimian, G.C.; Ileanu, B.; Jablonský, J.; Fábry, J. Analysis of European Labour Market in the Crisis Context. Available online: http://www.vse.cz/polek/download.php?jnl=pep&pdf=440.pdf (accessed on 24 June 2015).
53. European Environment Agency. The European Environment—State and Outlook. 2015. Available online: http://www.eea.europa.eu/soer (accessed on 24 June 2015).