



Małgorzata Rutkowska-Podolowska, Pd.D. Eng.
Wrocław University of Technology
Faculty of Computer Science and Management
Department of Infrastructure of Management
malgorzata.rutkowska-podolowska@pwr.edu.pl
Phone: +48 71 320 40 18

GREEN JOBS AS AN ECO-INNOVATION

Introduction

The fifth assessment report published already in 2014 indicates that the main cause of global warming observed for over half a century is 95% human activity. Currently, one of the fundamental objectives of the European economies is to ensure a balance between economic growth and environmental protection needs. The creation of eco-innovation and green jobs that promote environmental protection and restore it to its natural state.

The concept of 'eco-innovation' is relatively new. The prefix 'eco' comes from the word ecology, while by the 'innovation' we mean everything that is new. It is generally acknowledged that the eco-innovations generate new products and processes which provide the consumer and business with values but also reduce environmental impact¹.

Research on eco-innovations began already in the 90s of the twentieth century. Their development was influenced, among others, by increasing awareness of environmental threats, as well as by seeking more sustainable model of economic development. The pioneers of this study were C. Fussler, P. James, R. Kemp and P. Pearson. The aim of eco-innovation is the development of new products and processes that significantly reduce their negative impact on the environment. One such innovation is the creation of green jobs, which aim to reduce the pressure on the environment from the economy and consumption.

Green jobs are assumed to be derived and categorized as socio-professional white, blue, pink, gold, and now also green collar (Table. 1). These terms have been introduced in the American sociology to describe people working in various professions. This terminology was popularized in the United States in the 50s of the last century.

¹ Popławski Ł., *Ekoinnowacje – wybrane aspekty*, [in:] Problemy Światowego Rolnictwa, Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego T 15 (XXX), Z. 1, Wydawnictwo SGGW, Warszawa 2015, p. 107, [for:] Jones E., Harrison D., Mc Laren J., Managing creative eco-innovation, structuring outputs from eco-innovation projects, The Journal of Sustainable Product Design no. 1, 2001.

Table 1 Socio-Professional Categories

White collars	Blue collars	Pink collars	Gold collars	Green collars
people working in occupations that do not require physical labour. Most often they are identified with the workers employed in the public sector, public service employees, but also lawyers, tax advisors with the exemption of freelancers and entrepreneurs.	production workers and administrative entry positions. Blue-collar workers in the US actually usually wear collars in such a shade, because blue colours and similar dirt is not conspicuous. In addition, dyed denim is blue, or indigo, which is typical and fashionable. There is a wide range of wages for this kind of work depending on the field of specialization and experience.	white-collar workers (generally do not use a great physical effort), whose profession does not enjoy such prestige similar to the white collars. The pink-collars include, for example, librarians, florists, secretaries, flight assistants, day carers, social workers, beauticians, etc.	professionals with higher education, whose work requires the use of specialized knowledge to solve problems. Among those belonging to this group are: lawyers, doctors, accountants, engineers, college professors. These terms reserved also for young, low-paid workers, who spend money on easily conspicuous luxuries.	workers – in jobs and positions resulting from the inclusion of the principles of sustainable development in the processes of modernization. These are mainly jobs related to the sector of public transport, renewable energy, construction and waste management.

Source: Own study based on: <http://www.governica.com> [access: 20.04.2016] for: 'Oxford English Dictionary', 3rd edition. Electronically indexed online document. White collar, usage 1, first example.; Boys in Steel Mills, 'Wall Street Journal', June 30, 1923.

The first part of the article presents issues concerning eco-innovation, its later part analyses the green jobs in selected countries in EU. The methodology is based on the analysis of available literature. Descriptive method was used as the initial tool and then, later in the study, a comparative analysis was added. The aim of the study is on the one hand to analyze and systematize the concept of 'eco-innovation' and on the other an indication that one of such innovations is the creation of green jobs. Moreover, examples of selected EU countries show that the greening of the economy creates new jobs and the development of green jobs affects economic development; mainly through the implementation of new solutions. It is also a chance for employment growth and the construction of innovative economy. The methodology used is based on an analysis of available domestic and foreign literature and analysis of statistical data, in which data for the years 2010-2015 have been used.

A review of selected definition

There are many definitions of concepts: eco-innovation and green jobs in Polish and foreign literature. The article presents the most important of them.

Defining the concept of eco-innovation, at European level, have been undertaken by, i. a.: The European Commission, the OECD and Eurostat. The European Commission defines eco-innovation as ‘a form of innovation aiming at significant and demonstrable progress towards achieving the objectives of sustainable development by reducing the impact on the environment or achieving a more efficient and responsible use of natural resources, including energy’². In The Framework Programme for Competitiveness and Innovation eco-innovation was defined as innovations reducing environmental impact or having the purpose of making better use of environmental resources and thus serving sustainable development³. In Poland, the concept of eco-innovation wasn’t defined for the first time by the Central Statistical Office until 2009. Eco-innovation is defined as ‘innovation that benefits the environment, as a new or significantly improved product (product or service), process, marketing method or organization that bring environmental benefits compared with the alternatives’⁴. According to the classical definition, eco-innovation is a new product that provides value to the customer and the business and at the same time significantly reduces the negative impact on the environment.⁵ For the purposes of the article the most adequate definition assumes that ‘innovation is a new or significantly improved product (goods or service) introduced to the market, or a new or significantly improved process introduced into the company. Innovations use the results of technological developments, new combinations of existing technology or utilization of other knowledge desired by the company’⁶.

Another concept covers green jobs. It is any kind of professional activity which helps to protect the environment and fight climate change by saving energy and raw materials, to promote renewable energy, reduce waste and pollution and protect biodiversity and ecosystems⁷. The International Labour Organization (ILO, International Labour Organization) defines a Green Workplace (GW) as ‘jobs which contribute to the protection or improvement of the environment, both in traditional sectors, e.g. in the construction industry, as well as in

² Competitiveness and Innovation Framework Programme (2007 to 2013), Decyzja nr 1639/2006/WE Parlamentu Europejskiego i Rady z 24 października 2006 r. (Dz. U. UE L z 2006, Nr 310, p. 15), preambuła p.25.

³ Decyzja NR 1639/2006/WE Parlamentu Europejskiego i Rady z dnia 24 października 2006 r. *ustanawiająca Program ramowy na rzecz konkurencyjności i innowacji (2007–2013)*, Dziennik Urzędowy Unii Europejskiej, L 310/15.

⁴ Działalność innowacyjna przedsiębiorstw 2006-2009, GUS, Warszawa 2010, p. 48.

⁵ James P., *Toward sustainable bussines?*, [in:] Sustainable Solution, ed. M. Charter, U. Tischner, Greenleaf Publishing, Sheffield 2001.

⁶ Woźniak L., Dziejczak S., Ziółkowski B., Stec-Rusiecka J., *Innowacje ekologiczne w rolnictwie i przetwórstwie rolno-spożywczym oraz na obszarach wiejskich*, [in:] Innowacje ekologiczne w rozwoju społeczno-gospodarczym, pod red. L. Woźniaka, J. Krupy, J. Grzesik, Wydawnictwo Wyższej Szkoły Informatyki i Zarządzania, Rzeszów 2006, p. 57.

⁷ Zielone miejsca pracy, Sprawzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf [dostęp: 19.04.2016].

the sectors of green, emerging, for example in renewable energy'⁸. According to the ILO green jobs⁹:

- contribute to reducing the consumption of energy and natural resources,
- reduce greenhouse gas emissions,
- limit the amount of waste and pollution,
- contribute to the protection of ecosystems and restore their original state.

Additionally the definition given by the European Commission in 2012, considers green jobs as 'all jobs dependent on the environment or created, converted or transformed (in terms of greening skills, working methods, profile position) in the transition towards a greener economy'¹⁰.

Green jobs can arise in any sector of the economy and it is important that people should be employed directly or indirectly involved in improving the environment in the area, and prevents ventures harmful to the environment. If green jobs are an innovation in environmental protection, then particularly noteworthy are jobs created in areas aimed at achieving savings in the use of natural resources, e.g. renewable energy sources are the potential creator of green jobs.

Green Jobs in Renewable Energy Sources (RES) based on selected European Union countries

In response to the global economic crisis that began with the crisis in global financial markets in the second half of 2008 and transformed in the 80s into the most serious economic and social crisis, there was the concept of the green economy. It is a new tool for achieving the objectives of balanced and sustainable development. Greening the economy is dealt with in many ways and includes a number of narrower issues, i.e.: renewable energy, green jobs.

The examples of initiatives related to green jobs spread both from the United States, Brazil and European countries. Green jobs grow primarily in industries such as: air pollution control, soil regeneration, recycling, energy production from renewable sources and water supply. At the same time, it is estimated that increasing energy efficiency by 1% per year for

⁸ <http://www.euractiv.pl/demokracja/wywiad/zielone-miejsca-pracy-006635> [access: 20.04.2016].

⁹ Szyja P., Zielona gospodarka w Polsce – stan obecny i perspektywy, [in:] Nierówności Społeczne a Wzrost Gospodarczy, nr 41 (1/2015), s. 436.

¹⁰ for: Raport, *Zielone miejsca pracy a bezpieczeństwo i higiena pracy: Przewidywanie nowych i pojawiających się zagrożeń związanych z najnowszymi technologiami w perspektywie do roku 2020*, Streszczenie, Luksemburg 2013.

ten years will create and maintain 200,000 jobs across the European Union in the period¹¹. Environment friendly jobs (green jobs) in selected European Union countries are analyzed below.

Austrian Burgenland made it its goal in 1997 to achieve independence by 2050 through producing electricity from local renewable sources of energy. Burgenland became in 2013 the first region in Europe to meet its energy needs through local renewable energy sources, including wind, solar and biomass. The main objectives which were to increase employment and stimulate economic development and reduce energy production from fossil fuels and reduce energy costs in the region have also been achieved. In the area of the Land population of 284 000 inhabitants, up to 5 560 new jobs were founded, in result there has been an increase in GDP per capita 1 to 71% (1995) to 81% (2008) of the average for the EU-15¹².

The **Czech Republic** launched in 2009 a National Program Savings Ecological 2009-2012. Under this program, they promoted energy conservation in private households by granting participation in the initiative of direct subsidies amounting to the level of 30 to 75% of the costs incurred. In the Czech Republic - between 2009 and 2012 - more than 250 000 households that received total support in the amount of 967 million euros benefited from the program. Through this program:

- 16 000 jobs have been created or maintained. On top of this it is expected that the program will create or save at least 70 000 jobs,
- government grants awarded under the program enabled households to save 1.5 billion euros a year on heating costs¹³.

The region located in the North-West **France**, in Le Mans, located in *Pays de la Loire*, in the framework of the training program is a part of a broader regional strategy pursued by the Regional Council of Pays de la Loire, seeks on the one hand to develop the local wind sector and thus form new jobs and on the other hand to create new development opportunities for entrepreneurs. The aim is to increase the production capacity of wind power from the current 480 MW to 1 750 MW by 2020. Currently, the wind energy sector in the Pays de la Loire employs 6 240 employees operating within the 170 local companies, including small and medium-sized enterprises. Besides, the production capacity of wind power in the region increased by 166% compared to 2009. In 2013 the Pays de la Loire was the sixth among

¹¹ Green Word Report, <http://www.jeanlambertmep.org.uk/2008/09/05/green-work-employment-skills-climate-change-challenge/> [access: 21.04.2016].

¹² Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, p. 39 [access: 21.04.2016].

¹³ Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, p. 55-56 [access: 21.04.2016].

French regions in terms of installed wind capacity. In addition, activities in the field of wind energy have also helped to mitigate the economic impact of the recession on the region - the level of unemployment there is one of the lowest in France (9.1% in 2013))¹⁴.

In the South- East of *Greece*, in the mountain village of *Anavra*, there is a wind farm numbering 20 wind turbines generating a total of 17.5 MW and able to provide electricity for 12 500-13 000 households. What's more, two more wind farms are being built - with 23 turbines with a total installed capacity of 20 MW. It is expected that these investments will create 20 permanent and 100 temporary jobs. Any excess electricity is sold, and already the first wind farm village gives an additional income of around EUR 60 000 per year. In addition, the village started cooperating with the local technical university in 2010 so as to start planning for the construction of small hydroelectric power and the remote heating system with biomass¹⁵.

In *Spain*, the leader in the production of energy from renewable sources is *Navarra*, which:

- created a Training Centre for Renewable Energy for young people and the unemployed, as well as for people employed in the new sector,
- opened a national centre for applied research on wind energy, solar and biomass, and today it is a facility internationally known.

The renewable energy sector in Navarra represents more than 100 companies, including plants producing components of turbines and photovoltaic cells, companies providing services for the operation and maintenance systems, renewable energy, and research and development centres. These companies generate a total revenue of EUR 3.5 billion a year, directly employ 3 800 people (2.6 times more than in 2002), Accounting for 5% of the GDP of the region (which is more than twice the average for the sector in Spain calculated in terms of national GDP 2.4%). Enterprises located in Navarre region produce 17 % of all wind turbines sold worldwide. Renewable energy provides 81% electricity consumed in the region (according to data from 2011 the corresponding figure for the whole Spain was 42.4%, and for Europe - 20.6 %) ¹⁶.

In *Germany*, just as in other countries, eco-friendly trend is used to restructure the economy; and so in *Bremerhaven*, a seaside town in the state of Bremen, research into the

¹⁴ Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, pp. 43-44 [access: 21.04.2016].

¹⁵ Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, p. 27 [access: 21.04.2016].

¹⁶ Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, pp. 47-48 [access: 21.04.2016].

wind energy sector and intensive professional training were invested in infrastructure,. Wind Energy Agency (WAB) was established in 2002 –it was a network of 300 companies and institutes active in the wind energy sector (manufacturing, installation and testing) which was to be a national centre for the development of offshore wind energy. Today in Bremerhaven the wind sector employs 1 000 people (in 2012. Number of people employed in this sector in Germany amounted to 117 900). In addition, the federal state of Bremen in the renewable energy sector employs no less than 4 050 people. At the same time, through the development of renewable energy sources, including local small and medium-sized enterprises in the construction, engineering, steel sector and other companies producing components of wind turbines noted significant benefits¹⁷.

The organic sector in the *British Isles* is increasingly perceived as an important source of economic growth. At the turn of 2011/2012 there were up to one million full-time employees. It is predicted that by 2020 half a million new jobs will have been created. In London in 2011 a ground level initiative of local communities was founded¹⁸, with the aim of expounding the potential of green jobs and founding a London Partnership for Environmental Competence (London Green Skills Partnership). This partnership has expanded to other areas in the United Kingdom. This initiative included i.e.:

- establishment of the pioneering cooperative work Lewisham New Leaf Collective in order to link the production of energy from renewable sources to the modernization of social housing in line with the principles of balanced and sustainable development,
- conclusion agreements between the country's largest construction companies and service providers covering trainings, internship, benefits, guaranteed job interviews, and employment practices in the fields of energy saving and sustainable development for workers and the unemployed from South London¹⁹.

Targets for increasing employment and stimulating economic development, which result from greening the economy and create green jobs contributed to the reduction of unemployment in the regions concerned and increased energy production from renewable fuels, and consequently reduced expenditures on energy region. Today, already 26% of the EU's energy comes from renewable sources. About 10 % of the total EU electricity comes

¹⁷ Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, s. 32 [dostęp: 21.04.2016].

¹⁸ pracodawcy, związki zawodowe, dostawcy usług edukacyjnych, władze lokalne oraz pozostali przedstawiciele lokalnych społeczności.

¹⁹ Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, s. 51-52 [access: 21.04.2016].

from renewable energy sources with variable characteristics of production (such as wind or solar)²⁰.

Conclusions

The analysis presented in the article clearly shows that green jobs are in nature eco-innovation, because:

- Strong focus on innovation gives an impulse to the "greening" of the economy. In the long term stability policy promotes ecological transformation and therefore is a prerequisite for creating and maintaining green jobs.
- Greening of the economy creates new jobs, which in turn is to be the option to the current economic situation. Significant potential for creating green jobs is a renewable energy source, since many of the so-called green technologies are new and just developed and therefore such jobs rising at centres of research and new technologies generate further growth in innovation.
- Feedback occurs between eco-innovation and green jobs. This means that green jobs contribute firstly to promoting investment and economic growth and balanced and sustainable development, and secondly, investing in innovative, environmentally friendly technologies can contribute to the emergence of a significant number of new jobs.

Bibliography

- [1] Competitiveness and Innovation Framework Programme (2007 to 2013), Decyzja nr 1639/2006/WE Parlamentu Europejskiego i Rady z 24 października 2006 r. (Dz. U. UE L z 2006, Nr 310, s. 15), preambuła p.25.
- [2] Decyzja NR 1639/2006/WE Parlamentu Europejskiego i Rady z dnia 24 października 2006 r. *ustanawiająca Program ramowy na rzecz konkurencyjności i innowacji (2007–2013)*, Dziennik Urzędowy Unii Europejskiej, L 310/15.
- [3] *Działalność innowacyjna przedsiębiorstw 2006-2009*, GUS, Warszawa 2010.

²⁰ Sprawozdanie Komisji dla Parlamentu Europejskiego, Rady, Europejskiego Komitetu Ekonomiczno-Społecznego i Komitetu Regionów, Sprawozdanie z postępów w dziedzinie energii odnawialnej, Bruksela, dnia 15.6.2015 r., <http://ec.europa.eu/transparency/regdoc/rep/1/2015/PL/1-2015-293-PL-F1-1.PDF>, p. 3 [access: 21.04.2016].

- [4] James P., *Toward sustainable bussines?*, [in:] Sustainable Solution, ed. M. Charter, U. Tischner, *Greenleaf Publishing*, Sheffield 2001.
- [5] Popławski Ł., *Ekoinnowacje – wybrane aspekty*, [in:] Problemy Światowego Rolnictwa, Zeszyty Naukowe Szkoły Głównej Gospodarstwa Wiejskiego T 15 (XXX), Z. 1, Wydawnictwo SGGW, Warszawa 2015. [for:] Jones E., Harrison D., Mc Laren J., *Managing creative eco-innovation, structuring outputs from eco-innovation projects*, *The Journal of Sustainable Product Design* no. 1, 2001.
- [6] Raport, *Zielone miejsca pracy a bezpieczeństwo i higiena pracy: Przewidywanie nowych i pojawiających się zagrożeń związanych z najnowszymi technologiami w perspektywie do roku 2020*, Streszczenie, Luksemburg 2013.
- [7] Szyja P., *Zielona gospodarka w Polsce – stan obecny i perspektywy*, [in:] *Nierówności Społeczne a Wzrost Gospodarczy*, nr 41 (1/2015).
- [8] Woźniak L., Dziejic S., Ziółkowski B., Stec-Rusiecka J., *Innowacje ekologiczne w rolnictwie i przetwórstwie rolno-spożywczym oraz na obszarach wiejskich*, [in:] *Innowacje ekologiczne w rozwoju społeczno-gospodarczym*, pod red. L. Woźniaka, J. Krupy, J. Grzesik, Wydawnictwo Wyższej Szkoły Informatyki i Zarządzania, Rzeszów 2006.
- [9] Eurostat, dane z lutego 2016, www.eurostat.eu [access: 20.04.2016].
- [10] Green Word Report, <http://www.jeanlambertmep.org.uk/2008/09/05/green-work-employment-skills-climate-change-challenge/> [access: 21.04.2016].
- [11] <http://www.governica.com> [access: 20.04.2016] for: 'Oxford English Dictionary', 3rd edition. Electronically indexed online document. White collar, usage 1, first example.; Boys in Steel Mills, 'Wall Street Journal', June 30, 1923.
- [12] <http://www.euractiv.pl/demokracja/wywiad/zielone-miejsca-pracy-006635> [access: 20.04.2016].
- [13] Sprawozdanie Komisji dla Parlamentu Europejskiego, Rady, Europejskiego Komitetu Ekonomiczno-Społecznego i Komitetu Regionów, Sprawozdanie z postępów w dziedzinie energii odnawialnej, Bruksela, dnia 15.6.2015 r., <http://ec.europa.eu/transparency/regdoc/rep/1/2015/PL/1-2015-293-PL-F1-1.PDF> [access: 21.04.2016].
- [14] Sprawdzone rozwiązania dla Europy, http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf, p. 32 [access: 21.04.2016].



[15] Zielone miejsca pracy, Sprawdzone rozwiązania dla Europy http://www.greens-efa.eu/fileadmin/dam/Documents/Publications/GND/Green_jobs_PL.pdf [access: 19.04.2016].

Summary:

The aim of the paper is to present innovation of green jobs as eco-friendly. The first part of this presentation refers to green jobs as coming from US sociology. Next part analyzes founding green jobs in creating EU selected countries in relation to economical increase in mentioned areas.

Key words: innovation In environmental protection, greek jobs, RES