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Green jobs and changes in modern economy on the labour market

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GREEN JOBS AND CHANGES IN MODERN ECONOMY ON THE LABOUR MARKET

Summary

The paper presents green jobs as solution for two main challenges of modern economy: young people unemployment and care about environment. Development of technology and youth are the principal agents for socio-economic changes which demand now to empower young people with a supportive environment and appropriate opportunities for employment. In this paper it is proved that reduction of unemployment can be achieved by creation of new green jobs, which are also available for not qualified young people or other unemployed candidates, who need to change their occupation.

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1. Introduction

The last quarter of the twentieth century saw the creation of nearly a hundred million green jobs in the labour markets of the advanced industrialized world. This achievement, in which every economy shared, testifies to the apparently enduring power of capitalism to generate the prosper of paid work for the employers. Therefore, green jobs are element of ongoing social and economic change which takes place in modern economy[1]. This change has two dimensions. First, a shift from isolated and centralized economies to open and cooperative societies, which mainly want to live closer to nature and keep work-life balance. Second dimension is taking action in mobilizing the potential of young Europeans. Young people when productively employed are an asset to their communities and to the world. Youth is vibrant, creative and energetic. Ironically the same qualities in young people, if thwarted, lead to social unrest, conflict, and economic instability.

It is imperative that structures should be generated to ensure sustainable employment for young people and sustainable development of modern economy. However a large group of young people cannot be absorbed in an urban and industrial employment, at least in a short run. High levels of youth unemployment contribute to poverty, discontentment, alienation, social unrest, conflict and urban migration, all of which hinder economic growth and threaten political stability. Therefore, the idea of green jobs can be a solution for both mentioned key

[1]Green F., *Demanding work, the paradox of job quality in the affluent economy*, Princeton University Press, Princeton 2007, pp.1-5.

trends in economy – sustainable development and enhance of young people employment. Moreover, green jobs are workplaces of the future because they involve *knowledgeable workers* which are part of development of industrial capitalism[2].

2. Green jobs

The literature does not provide a wide accepted definition of green jobs. For the purposes of the paper it is assumed that *green jobs*, according to the United Nations Environment Program[3], can be defined 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 all together avoid generation of all forms of waste and pollution"[4].

Renewable energy is energy that is generated from natural processes that are continuously replenished. Renewable energy includes biomass, solar, wind, hydro-power and geothermal sources. This energy cannot be exhausted and is constantly renewed. A distinctive feature of renewable energy, in comparison to the typical conventional energy, is lack (or a significantly smaller range) of its impact on the environment. According to the definition of International Energy Agency (IEA) renewable energy is obtained as a result of natural processes and constantly replenished[5]. Energy can be called renewable when:

- its source cannot run out (like the sun) or can easily be replaced (like wood, as we can plant trees to use for energy),
- their sources are carbon neutral. This means they do not produce carbon compounds (such as other greenhouse gases),
- they do not pollute the environment (air, land or water).

The Renewable Energy Policy Project breaks down roughly how many jobs could be created per megawatt of different types of renewable energy, it means:

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[2] Thompson, P. Warhust Ch., *Hands, hearts and minds: changing work and workers at the end of the century* [in:] *Workplaces of the future*, Thompson P., Warhust, Ch. [eds.] London 1998, Macmillan Press, ISBN 0-333-72799, pp. 7-9.

[3]United Nations Environment Programme, *Towards decent work in a sustainable, low-carbon world,* 2008, p. 36http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf, access: 18.09.2016.

[4]United Nations Environment Programme, *Towards decent work in a sustainable, low-carbon world,* 2008, p. 38http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf, access: 18.09.2016.

[5]IEA, Directorate of Sustainable Energy Policy and Technology, https://www.iea.org/topics/renewables/, access: 10.09.2016.

- solar could provide the most at 22 jobs per megawatt,
- manufacturing could provide 15 jobs per megawatt,
- geothermal could provide 15 jobs per megawatt.

Construction and installation of solar panels would be next at seven, followed by wind at six jobs per megawatt. A large wind turbine produces one to three megawatts, for example, so a large wind farm of such turbines could produce up to several hundred megawatts[6].

3. Goals and methods

This paper presentsthe youth employment opportunities in the renewable energy sector: the green job possibilities. As a positive step towards understanding their role in solving the problem of the energy crisis, it is essential that youth first understand what the problem is, where the solution lies and how some organizations have already started working on this issue (i.e. European Commission). They are working towards creating an environmentally sustainable world, while also providing employment opportunities.

The number of jobs created by renewable energy sector and their impact to the labour market can be analysed based on historical statistic data and researches. In this article some of this data collected by the International Renewable Energy Agency (IRENA) for 2014-2015 and data collected by European Commission for the years 2004-2014 were used respectively to quantitative analysis. This analysis covered jobs created directly by renewable sources, especially wind energy. We assume that jobs created by other branches of economy, involved in services related to this energetic sector, can be described in other publications[7].

4. Wind energy as an example of RES

Wind power next to solar photovoltaic still remains the most dynamic renewable energy technology[8]. From historic point of view the wind energy with the burning of wood was soon exploited AS humans' renewable energies. In ancient Babylon (2000 years BC) it helped windmills pump water, water its fields and drain wetlands, long before it was used in shipping. In India (400 years BC) there is the first record of using the fan to transport water, and 200 years BC the Chinese used windmills in the shape of winches to irrigate fields. With

[6]Lydersen, K., *What the Economy needs now are good, green jobs*, 2008; http://www.alternet.org/story/100343/what_the_economy_needs_now_are_good,_green_jobs; access: 25.09.2016.

[7] Education Development Center of European Commission, *Youth Employment Opportunities in Renewable Energy – A report*, Youth Employment Summit 2002, http://shuraako.org/sites/default/files/Youth%20Employment%20Opportunities%20in%20Renewable%20Energy-%20A%20Report.pdf ; access: 02.10.2016.

the advent of our era windmills began to appear in the Mediterranean countries. First documented mention of windmills appears in the year 644 AD - with their help people in Middle East ground their grains in windmills. In Europe (XVIII c.) windmills were built also. One of the specialists in their construction were Dutch. English designer Edmund Lee, who constructed a wheel automatically directing the windmill into the wind in 1745. The development of the steam engine in the late nineteenth century led to the disappearance of the drive-wind in many fields of industry, which resulted in a lull in the art. With the discovery of electricity windmills can find a new use. American scientist and businessman Charles F. Brush in 1888 built a turbine comprising a rotor diameter of 17 m and 144 wooden shovels, and the same as the first advantage of wind energy to produce electricity[9]. As presented the wind energy was know and used much earlier. For example, wind energy is certainly not new to the State of Pennsylvania – the earliest European settlers arrived on wind-powered ships, and many windmills were used during colonial times, including a 1746 octagonal windmill on "windmill island" in the Delaware River (Joseph Jackson, Encyclopaedia of Philadelphia, 1931). In 1950, engineer Johannes Juul built the first wind turbine generator of alternating current. "Before 1970's energy and especially fossil fuels, were considered as cheap and amply available. In 1972, the report "Limits of Growth" was published, stressing the limited resources of, among others, fossil energy carriers, and discussing the limits this would impose on future economic growth"[10]. Shortly after this publication, the first energy crisis occurred, presenting the world economy with shortages and rapidly increasing fuel prices. This lead to economic crisis since the energy intensive industries, which were very important to western economy, were hit very hard by this sudden increase in price of the one of their raw materials. Therefore, because of the energy crisis in 1973, there has been renewed interest in renewable energy sources and wind energy especially. Since then, wind power is one of the fastest growing industries[11].

Nowadays, that is, from the end of the last century, they created a device that can produce energy on an industrial scale at acceptable prices. Today turbines are available range from tens of kW, after a large number of megawatt unit. At the end of 2008 the total installed capacity amounted to 1,5GW, acting 1.5% of global electricity consumption. Wind energy will play an increasingly important role in the global energy balance, decide first and foremost the development of large wind farms[8].

[8]MAE, *Energia wiatru*, http://www.mae.com.pl/odnawialne-zrodla-energii-energia-wiatru.html access: 16.09.2016

With UN agencies issued a report REN21 (Renewable Energy Policy Network for the 21st Century) shows that renewable energy sources - primarily solar and wind power - already responsible for 27.7 % of global installed capacity (equivalent to meet 22.8 % of global energy demand)[9].

5. Wind energy and young people as the agents of change in modern economy

Wind energy jobs sector remain relatively stable at 0.8 million jobs created across EU every year[10]. Its growing demand is constantly absorbing a large amount low skilled unemployed people, and can be also an opportunity for young people looking for their first stable employment[11].But the reality is that there are abouta billion young adults and youth between the ages of 15 and 24, which are unemployed in the European Union today[12]. 85% of them live in communities providing only few opportunities for productive work. This young people can be involved in green jobs sector and this is proposed in this paper. If the youth get involved with conserving the environment by producing clean energy, then we will simultaneously solve the problem of youth unemployment and environmental degradation.

If we consider usage of wind energy as an innovation (basic and even imperfect one) then we can use the innovation theory model to explain future impact of this kind of investments onto the whole labour market (both its sides: supply and demand). Moreover, we assume that activities involving synchronous time-generated processes, result in socioeconomic development[13]. These activities are: the fundamental science, the applied science area, the production, and the use diffusion area[14]. Wind energy industry uses these four dimensions of development to increase its importance and therefore it can become an important agent of change for the labour market. According to the innovation theory model these four sectors and their respectively time-generated exponential process are only one part of the development picture. The other is the interrelationship among the different sectors. Socioeconomic development with wind energy usage entails a complicated macro exchange

[9]Renewable Global Status Report – RES21, http://www.ren21.net/ access: 20.08.2016

[10]International Renewable Energy Agency (2016a), p.16. *Renewable Energy and Jobs: Annual Review 2016*, http://www.irena.org/DocumentDownloads/Publications/IRENA_RE_Jobs_Annual_Review_2016.pdf, access: 25.09.2016.

[11]Green, F., *Demanding work, the paradox of job quality in the affluent economy*, Princeton University Press, Princeton 2007, pp.35-37.

[12] Fic, M. *Niedopasowanie kwalifikacji i bezrobocie ludzi młodych w Unii Europejskiej*. Problemy profesjologii, vol. 2, 2015 pp.53-65.

[13] HammblinR., Jacobsen R., Miller J., *A mathematical theory of social change,* A Willey-Interscience publication, New York 1973, p.176.

[14] HammblinR., Jacobsen R., Miller J., *A mathematical theory of social change,* A Willey-Interscience publication, New York 1973, p.177.

process among the various development sectors, and the output of each sector supplies the inputs for one or more of other sectors. Hence socioeconomic development can be thought of as a system with parts, in which each part's output provides an input of one or more other parts. The outputs are changing through time, because the entire economy network is in a dynamic equilibrium[15].

Table 1. Green jobs and registered unemployment in chosen countries

	Registered unemployment [%]						Green jobs as a % of all new created jobs					
	2010	2011	2012	2013	2014	2015	2010	2011	2012	2013	2014	2015
Belgium	8,3	7,2	7,6	8,4	8,5	8,5	x	x	0,1	0,4	0,5	0,3
Denmark	7,5	7,6	7,5	7	6,6	6,2	0,6	0,5	0,9	0,2	0,9	0,4
Germany	7	5,8	5,4	5,2	5	4,6	3,3	3,2	3,5	3,5	3,7	3,8
Netherlands	5	5	5,8	7,3	7,4	6,9	0,7	0,3	0,9	0,4	0,5	0,2
Poland	9,7	9,7	10,1	10,3	9	7,5	x	0,8	0,2	0,2	0,4	0,3

Source: Eurostat 2016a[16] and authors own calculations based on 2016b[17]; x means no data

In table 1 registered unemployment rates and green jobs as % of all new created jobs of the chosen countries of the EU are presented. Germany is the only country with a decreasing unemployment rate and an increasing number of green jobs created in the same period. Moreover, this number (percentage of all new created job places) is stable in an observed period of time contrary to other countries.

In table 2 we present new green jobs created in the renewable energy sector in the years 2014 and 2015.Among the chosen countries of the northern coast of Europe, Germany is one of the leading countries in employment concerning wind energy sector (table 2). In Germany only in 2014 and 2015there were respectively 148,6 and 149,2 thousands of people employed. In Poland in 2014 about 8,3 thousands of people worked in wind power energetic sector. This sector has a big potential, comparable with the cement industry where about 6

[15] Rutkowska-Podołowska, M., Sulich, A., Szczygieł N., *Green jobs,* Proceedings of the 3rd International Conference on European Integration 2016, ICEI 2016: May 19-20, 2016, Ostrava, Czech Republic. Pt. 2 / [Eds. Eva Kovářová, Lukáš Melecký, Michaela Staníčková]. Ostrava: VŠB - Technical University of Ostrava, cop. 2016. pp. 822-829.

[16] Eurostat 2016a, *Unemployment by sex and age - annual average*, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=une_rt_a&lang=en, access: 02.10.2016.

[17] Eurostat 2016b, *Research and innovation statistics at regional level*, http://ec.europa.eu/eurostat/statistics-explained/index.php/Research_and_innovation_statistics_at_regional_level, access: 02.10.2016.

thousand workers were employed, when in the oil industry 9 thousands in 2014[18]. As presented in Table 2 there are also other renewable energy technologies, which have an impact on the labour market. And for example the solar photovoltaic technology in world classification stands on the first place, when liquid bio fuels are on the second position. Moreover, it should be emphasized that each country specializes in developing one of the technologies using kinds of RES. For example, Poland specializes in biomass, when Belgium in liquid bio fuels (table 2).

Table 2. New jobs in renewable energy sector in 2014 and 2015 in thousands in chosen countries, European Union and World

Specifications	**European Union**		**Belgium**		**Denmark**		**Germany**		**Netherlands**		**Poland**	
Year	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Solar PV	164,0	220,0	2,8	3,0	0,8	0,9	38,0	38,3	5,4	5,5	0,2	0,3
Liquid bio fuels	98,0	106,0	7,9	8,3	1,3	1,4	22,4	23,1	3,0	3,0	4,8	5,9
Wind Power	320,0	306,0	3,4	3,7	29,5	30,0	148,5	149,2	1,8	2,0	8,3	8,4
Biomass	343,0	210,0	3,2	3,3	3,8	3,9	47,9	48,5	2,8	3,9	12,9	18,5
Solar Heating/Cooling	37,0	43,0	0,4	0,5	1,7	1,8	10,2	10,3	0,4	0,6	1,9	2,6
Biogas	66,0	68,5	0,3	0,4	0,1	0,2	45,5	48,5	0,4	0,6	0,5	0,4
Small Hydropower	41,0	32,0	0,1	0,1	0,1	0,1	0,9	11,8	0,0	0,1	1,9	2,0
Geothermal	101,0	100,4	0,5	0,6	1,9	2,1	12,5	17,2	4,4	4,5	0,9	0,9
CSP	15,0	29,0	0,6	0,6	0,5	0,6	4,3	8,7	0,9	1,3	0,0	0,1
Total	1185,0	1114,9	19,2	20,5	39,7	41,0	330,2	355,6	19,1	21,5	31,4	39,1

Source: IRENA (International Renewable Energy Agency) 2014[19], and IRENA 2016a[20].

6. Impact of green jobs on the labour market

Youth's or young people's unemployment is a problem in the economy, which is connected with both youth transition into labour market (or integration with labour market)

[18]*Bukowski, M., A. Śniegocki, J. Gąska. M. Kosuń, Wpływ energetyki wiatrowej na polski rynek pracy*, Wyd. Warszawski Instytut Studiów Ekonomicznych, Warszawa 2014, p. 5.
[19]International Renewable Energy Agency (2014), *Renewable Energy and Jobs: Annual Review 2014*, http://www.irena.org/publications/rejobs-annual-review-2014.pdf, access: 25.09.2016.
[20]International Renewable Energy Agency (2016a), *Featured Dashboard – Employment*; *Renewable Energy Employment*, http://resourceirena.irena.org/gateway/dashboard/?topic=7&subTopic=10 access: 30.09.2016.

and society expectations towards governments[21]. One of the reasons of youth unemployment can be also competency mismatch which may include also other mismatches: competency gap, candidates' qualifications and education (too low or too high, other mismatches (vertical and horizontal) or mismatches between demand and supply on labour market .

Therefore, some of the green jobs – especially the ones related to wind energy - do not require sophisticated and higher education on most levels (except of project works). Green jobs can be a new opportunity for both groups: those who are not involved in work and those who are employed to improve the quality of their work. Young people with competency gap can easily find their new employment in the wind energy sector during their internships and afterwards through full contracts. The green jobs also involve and promote research into youth work, forming a much-needed bridge between theory and practice in this area.

While some jobs require specific skills or education, such as: a solar engineer, an environmental scientist, a wind project manager or a sustainability consultant, other positions do not necessarily require a background as the role involves working for an organization in this sector.

7. Conclusions

Today's world faces challenges in the form of population growth, resource consumption and environmental degradation. The environment is threatened by the perils of global warming, climate change, and energy crises. Unless some immediate remedial measures are taken, things are only expected to get worse. There is a need to protect the environment and at the same time to provide young people with opportunities for sustainable livelihoods. If youth get involved with conserving the environment by producing clean energy, then we will simultaneously address the problems of youth unemployment and environmental degradation.

Green jobs can help young people to become expertise workers in areas ranging from structured dialogue, through effective communication skills to teamwork. They can also help young people to achieve better transition between school education and professional lives, to tackle the problems of unemployment among young problem, as well as to stimulate research

[21]Sulich, A.,*The young people's labour market and crisis of integration in European Union*.Proceedings of the 3rd International Conference on European Integration 2016, ICEI 2016: May 19-20, 2016, Ostrava, Czech Republic. Pt. 2 / [Eds. Eva Kovářová, Lukáš Melecký, Michaela Staníčková]. Ostrava: VŠB - Technical University of Ostrava, 2016. pp. 926-934.

on the impact of non-formal learning on key competencies for green jobs and lifelong learning.

While it is imperative to take corrective measures to combat climate change, equally important is the necessity for developing countries to produce increasing amounts of energy – energy being a vital need for the development of any modern society. One solution that allows production of energy to continue without any adverse effect on the environment is the use of renewable energy. Renewable energy makes use of natural resources like wind, sunshine, and water to create energy. It thus prevents the release of carbon emissions into the atmosphere, thereby mitigating climate change while at the same time producing the energy much needed for development.

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13. International Renewable Energy Agency (2016a), Featured Dashboard – Employment; *Renewable Energy Employment*,

http://resourceirena.irena.org/gateway/dashboard/?topic=7&subTopic=10 access: 30.09.2016.
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21. United Nations Environment Programme, *Towards decent work in a sustainable, low-carbon world,* 2008, p. 36 http://www.unep.org/PDF/UNEPGreenjobs_report08.pdf, access: 18.09.2016.