Renewable energy support schemes – for environment and/or for investors?

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Abstract

In The EU2030 goal includes the increase of renewable energy share to at least of 27% of the EU's energy consumption. Renewables, especially photovoltaic energy investments and use became very popular in the last few years. New technologies and solution can contribute to an increasing development in renewable energy. However, there are societal factors that can influence this process. In order to achieve renewable goals governments started to support green electricity that caused huge boom in installed capacity in some central European countries. However, this increase causes negative effects, overuse of subsidies and the cut-back of supporting systems as states could not maintain this high level of support. Using the results of policy documents, development strategies, the author concludes by arguing that the key motivations of investing renewables are differs state by state, influenced by central government, but mainly depending on local stakeholders (mainly based on economic interests and using sustainability as a slogan, not reason). In order to find an ideal-typical supporting system we have to take into consideration not only economic but societal peculiarities as well.

Keywords: energy policy, renewable energy, subsidy, governance

1. Introduction

Preference for renewable energy sources is important not only because of the growing demand for energy but also because, according to the total life-cycle analysis of energy-producing installations, the environmental burden of the burning of fossil fuels is much heavier (air pollution, acid rain, thereby indirectly causing the pollution of waters, high levels of carbon-dioxide emission, which lead to the increase of green-house effects and to global warming) than that posed by renewable energy sources [1]. In accordance to this, EU2030 goal includes the increase of renewable energy share to at least of 27% of the EU's energy consumption, because of the climate change and to reduce (fossil) energy use. Renewables, especially photovoltaic (PV) energy investments and uses became very popular in the last few years.

Engineers and technological scientists are continuously providing know-how and new technological solutions what allow a significant increase in mass production causing a reduction in price, and this deployment resulted in wide-spread of new technologies in everyday life. New technologies and solution can contribute to an increasing development

in renewable energy. However, there are societal factors that can influence this process and these are usually skipped. Therefore, we argue, that it is important to take into consideration the „soft“ elements of the development in order to get a more deep understanding.
The paper focuses on the use of PV systems having regarded the receiving conditions of the society and its impact on it. Based on empirical and desk top research the paper reveals that how public is aware of renewable energy, and the peculiarities of the public involvement/participation in decision making (on local level) of such investment are also discussed.

2. Energy policies

The scale of the spread of PV energy production became huge by the end of 2014. One of the reasons could be the subsidy policy. The installation of systems became tangible from 2005, especially in the EU, where Germany has been the leader since 2004 [2], nonetheless, that the rate is only few % in the energy mix [3]. Concerning the literature solar energy can achieve a 10% rate in global energy mix by 2050. Due to the boom of renewables, there is a decreasing trend in subsidies. However, the predictable increase of photovoltaic systems raises several environmental policy and economic questions as well (cf. [4]).
The most important factor for photovoltaic energy production is the solar radiation, especially, because of the relatively law efficiency of the panels. However, as the German example shows us the role of radiation is not as important as it has been supposed beforehand. At the end of 2014 Germany bear the highest total and per-capita in-built PV capacity globally. Examining the solar radiation in Europe (Figure 1) and comparing the produced PV electricity (Figure 2) and the in-built capacity at the end of 2013 (Figure 3) we could see, that physical geographical factor is not dominant in installation.
The EU in its environmental policy declared the need for increase of renewable energy use (see 2001/77/EC and 2009/28/EC). In order to achieve the well known goals member states created strategies and programmes. According to these, countries use different support schemes in order to facilitate the spread of renewables. Tools of subsidy are various and their impacts on the spread of renewable technologies are different.

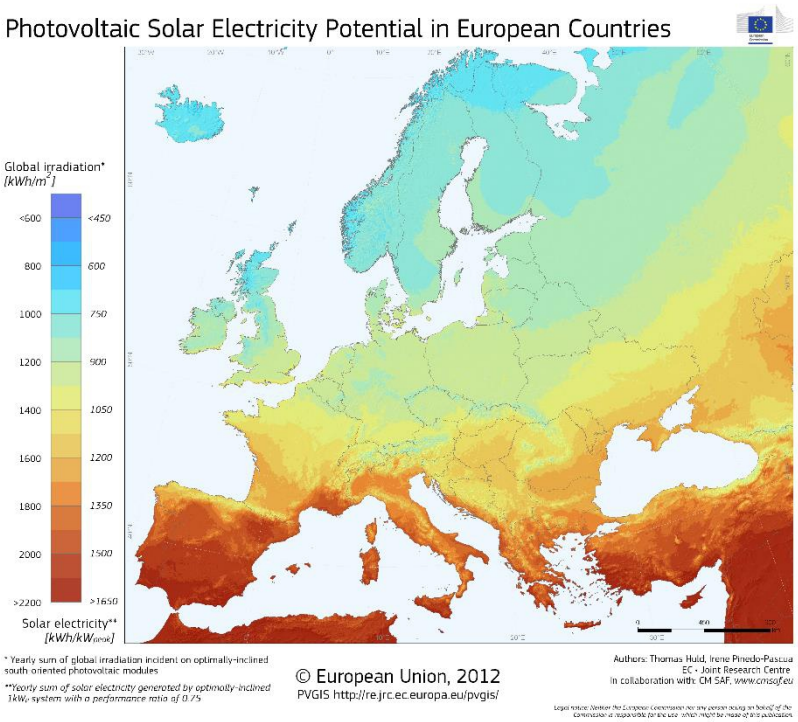

Figure 1. Photovoltaic Solar Electricity Potential in European Countries (Source: http://re.jrc.ec.europa.eu/pvgis/

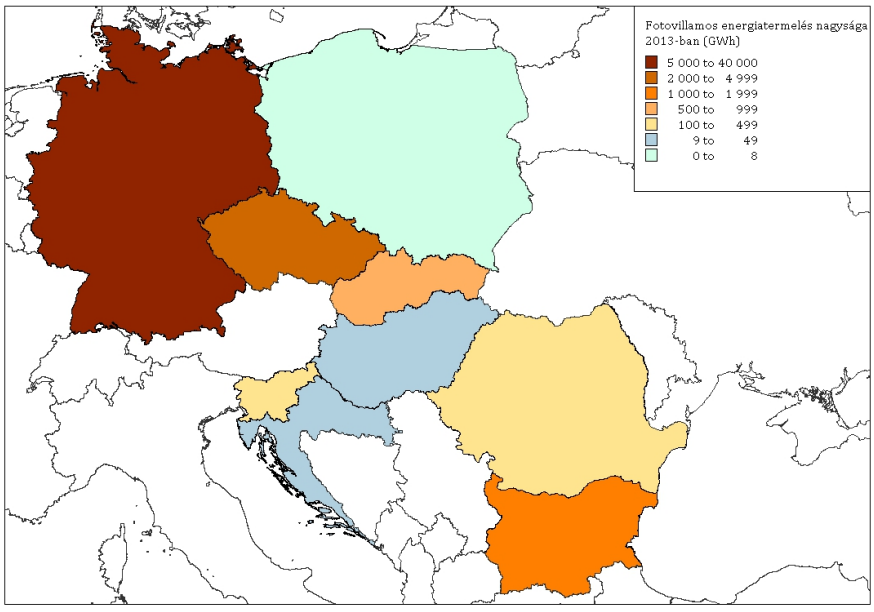

Figure 2. Photovoltaic energy production in some Central and Eastern European Countries in 2013 (GWh) (Source: own edition based on Photovoltaic energy barometer 2013 – EurObserv'ER, http://www.eurobserv-er.org/downloads.asp and http://photon.info)

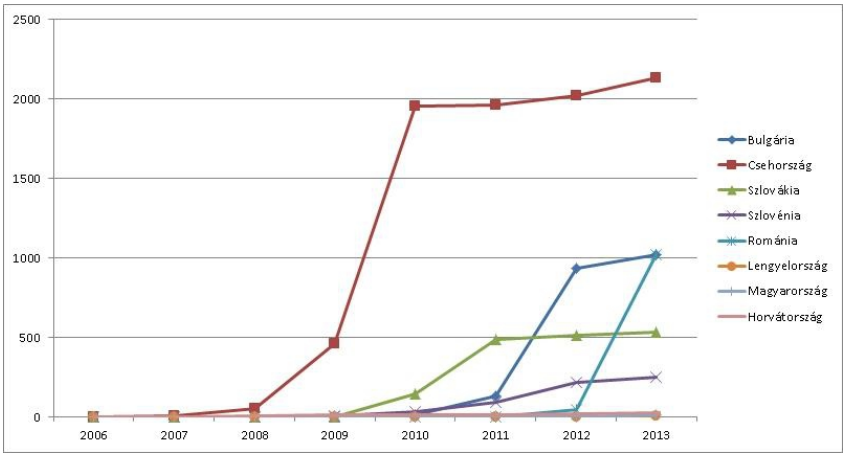

Figure 3. Photovoltaic in-built capacity in some Central and Eastern European Countries between 2006 and 2013 (MWp) (Source: own edition based on [5]; Photovoltaic energy barometer 2007, 2009, 2010, 2011, 2012, 2013 – EurObserv'ER, and http://photon.info)

In the region, in 2000, firstly Poland (then Slovakia in 2003) declared tax-supporting and investment supporting tools in order to increase electricity production from renewable resources. In 2002 Czech Republic, Hungary and Latvia, in 2003 Bulgaria, in 2004 Slovenia, in 2005 Slovakia, in 2007 Croatia and in 2009 Lithuania introduced fix or premium feed-in systems. In 2008 Poland and Romania introduced quota systems [6]. However, as it can be seen later on, the date of introduction of a subsidy system could not influence the spread of renewables.

2.1. Bulgaria

In Bulgaria, first investments were created for demonstration only in 2006, in order to measure performance and cost-efficiency of PVs. However, after the first pilots, there were new on-grid installations, therefore, Bulgaria achieved the 1375 kW in-built capacity by 2008 [5]. Afterwards, the government of Bulgaria turned out very ambitious plans. The plan was to produce 11% of the electricity by PV, based on the good solar radiation values, that is comparable to Spain [2]. To achieve this goal, their legislation (introduced in 2003) ensure the possibility to purchase green electricity up to 10 MWh (in every year). The guaranteed feed-in tariff, introduce in 2009, ensure the electricity – made by renewable resources - feed-in for the network for 25 years, however, the tariff is revised in every year. At the beginning of 2000' Bulgaria, from EU funds and with the support of EBRD provided reduced credit rates for investors [5]. Although, due to the boom of renewable PV investments – what meant 843 MWp in 2012, and 177 MWp in-built capacities in 2013 – Bulgarian government cut the support of renewable investments, and in July, 2014 introduced a higher network connection price [7]. In 2013, the government introduced profit tax in the renewable sector, what was finally withdrawn due to the international pressure[1].

[1] http://www.photon.info/photon_news_detail_en.photon?id=87458

2.2. Czech Republic

The Czech subsidy policy of renewable energy – especially PV production – resulted in an extreme increase of PV in-built capacity in 2010, what was similar to globally seventh Spain. This boom had not antecedent. The renewable energy goal of Czech Republic was 8% by 2010. Until 2008, the country was far from this aim and achievement was irrealistic. The reason of fallback was the delay in EU legislation introduction and the lack of renewably subsidy policy. Therefore, the publicised rate of 8.24% was a surprise in 2010. The reason was threefold. Due to the extreme wet weather conditions the electricity production rate of hydroelectric power plants was higher (129% of the average), on the other hand the PV in-built capacity increased in 2009, especially highly in 2010. Furthermore, the biogas capacity also increased by 2010. On the other hand, the electricity consumption decreased due to the financial crisis [8].

The reason of PV boom was the political and economic subsidy; (distributors had to receive electricity from renewable resources on a fix price what was guaranteed for 15+5 years) [8]. The fix price is revised in every year, however, the reduction of the price cannot be more than 5%. The new legislation for PV came into effect in 2009. Moreover, PV investments were supported by tax allowance, investment subsidies and with reduced credit rates [5]. Due to the supporting energy policy PV in-built capacity increased to 39.5 MWp by 2008, 464.9 MWp in 2009, and by 1959.1 MWp by the end of the year of 2010 [9]. At the end of 2013 this value was 2132 MWp (and in 2014: 2134 MWp) what meant a 10.1% percent of the Czech electricity capacity [10]. However, after 2010 the growth of PV capacity has stopped do to the state distributor and policy regulations which resulted the suspension of permission for PV plants [8]. Additionally, the government introduced an extra 26% profit tax for PV plants (above 30 kWp). On the other hand, due to the increased subsidy, the consumption price of electricity has also increased, from 6,7 EUR/MWh (2010) to 16.8 EUR/MWh) [11]. Although, there was a major protest from investor side, Czech government remained the high, 26% extra profit tax on PV, nonetheless, that investors' trust had been overwhelmed and investments has almost stopped.

2.3. Slovakia

Slovak PV energy production is characterised by overdue and boom development. In-built capacity was 20 kW until 2006 and only 66 kW until 2008. Dynamic increase started in 2010 [5], [12]. In 2009, in order to achieve EU2020 goals Slovak government decided to guarantee to receive PV electricity for 15 years. In this year the government introduced a diversified but generous feed-in premium price system. The basic feed-in tariff and the premium was guaranteed for 15 years. Moreover, in the planning period of 2007-13 there were additional Structural Funds for PV investments for SMEs [5]. At the beginning, the feed-in tariff price was very high, since the number of installation growth to 500 MW in 2010. After that there was a 33% cut in 2011, while by 2012 the feed-in tariff dropped by the half of the price in 2009 [13].

2.4. Slovenia

The 25% 2020 goal of Slovenia is very ambitious, especially comparing to the 9% real (of 2005). However, the basis of it are the 4.3% hydropower (2011) and the 7,2% (2011) wood biomass (based on the countries physical geographical conditions) [14]. PV has also priority in grid connection [5]. In 2009, the introduced legislation created a very safe and profitable environment for PV. State guaranteed to purchase all the PV produced electricity [15], besides, the tariff consist of a fix and a flexible part where fix price is guaranteed for 5 years, while flexible part is fixed for one year, based on the market price [5]. In 2012, prices caused a 12-13 years of returning rate for investors, while with a 50% non-refundable investment support the returning time could be 6-8 years [15]. Power plants (creating electricity from renewables) below 5 MWp can chose from the guaranteed feed-in tariff and the premiums price system, whilst, power plants above 5 MWp can get the actual market price plus a premium. The latter power plants also have to make a contract with the operator (Borzen) in every year for selling the electricity [14].

Due to the mentioned allowances in 2011, there were 1390 smaller or bigger PV power plants in Slovenia, producing more than 90 MWh of electricity. The production was 130 MWh in 2012 [15]. However, the boom caused financial problems in subsidy policy affected not only PV but biogas power plant as well. (Besides PV, in biogas sector there was a huge boom too causing risk in food production in Slovenia. From 2009, installation of PV systems increased with 400% each year therefore, government had to revise subsidy policy in 2011 and 2012 again and decrease the feed-in and premium tariff. From 2013, government started to focus the support on house-hold PV systems with 5% bonus [14].

2.5. Romania

In 2012, in Ernst&Young's (2012) analysis, Romania was a "renewable paradise". The use of renewable resources increased significantly. In 2009, in Romania the in-built renewable energy capacity was 12 MWp. Due to the boom, this value was 2880 MW in 2013. PV shared 1150 MWp from this capacity. Concerning [7], this boom had four main factors: (1) prosperous global and environmental background; (2) proper European and Romanian supportive legal frame; (3) very good physical geographical potential; (4) renewable supportive European and Romanian environmental policy [7]. [5] highlighted that PV plants have priorities in grid connection and the process is very simple.

In Romania there is not feed-in tariff. Support is come from green certificates. Concerning [2] the quota system combined with green certificates does not absorb costs into electricity prices, however, as [7] showed, Romania started to rethink subsidy system due to the increase of household electricity prices. Concerning [12], the reason of deployment is that the cost of the produced electricity is ¼ of the selling price, and the state also gives other investment.

The affect of the growth (and support) of renewables can be detected in electricity prices. The negative effect can be examined especially in energy-intensive sectors. Therefore, Romanian government decided to cut down the support of green certificates from 2017. The number and the maximum price for green certificates would be reduced [7].

In Romania neither energy efficiency, nor promotion of renewables were effectively managed, the development was thank to EU resources. The average subsidy rate was 42%, so investors need to add for their investment only 58% of the total cost [16].

2.6. Poland

The PV deployment in Poland was slow. The reason was the lack of effective subsidy system and the negative approach of Polish government. At the end of 2008, in-built PV capacity was 1.11 MWp, almost all of them were off-grid system. PV power plants have not priority in the connection to the grid and the connection process is also complex. Furthermore the feed-in system does not make differences between types and sizes, therefore small investments have drawback [5]. Due to the plans, Poland would like to introduce feed-in tariff system from 2017, instead of the recent green certificate. The explanation (concerning the government) is that the feed-in tariff system is cheaper for the state and the treatment of it is also easier. The feed-in tariff will be combined with auction in order to make competitive situation [7]. The Polish PV deployment is still low, in Sep. 2014, in-built PV capacity was only 6.6 MWp[2].

2.7. Hungary

Regarding to the Croatia and Hungarian PV productions and problems see in details [17], [3]. Here, we are only focusing on the most important peculiarities in connection with the topic.

As on the Figure 1 can be seen, physical geographical situation is good in Hungary, from 2000, there is legal basis for renewables, especially in the southwest, where the “biggest” PV power plant in Hungary was installed with 499 kWp capacity, in 2013. However, Hungary’s capacity is very low. Even though, Hungary introduced steep recycling fee on solar modules in 2015.

In Hungary, the actors of PV investments were mainly telecommunication companies households (in order to reduce electricity price). Hungary has the feed-in tariff system with the lowest tariff (0.100 EUR/kWh[3]) in the region. In 2012 the price was similar (0.109 EUR/kWh[4]) and recently so (0.105 EUR/kWh)[5]. Although there is a Structural Fund based support for renewable investors, however, the amount is very small. In Hungary, there is another barrier for big investments. Above 500 kWp, electricity producers have to give an electricity production schedule for the operator in advance and if there is a discrepancy, producers have to pay penalty. (This limit i.e. in Slovakia is 4000 kWp.)

[2] http://www.photon.info/photon_news_detail_en.photon?id=88370

[3] In 2009, 0,105 EUR/kWh, 1EUR=267,55 HUF

[4] 1EUR=295 HUF

[5] 1EUR=305 HUF

2.8. Croatia

In Croatia renewable regulation was slow; however, due to the preparation for EU accession the process has accelerated [18].

Produced energy from renewable resources is coordinated by HROTE. Feed-in tariff as a subsidy is available and higher than in Hungary. However, there is a limit in every year for renewables for allowances [19].

From 2003, Environment Protection and Energy Efficiency Fund give support for sustainable investments in Croatia [18].

In Croatia feed-in tariffs between 2007 and 2012 were much higher, however, the price cut down by 2012. Other regulation has also regulated the Croatian market, however, the conditions are better than in Hungary.

3. Beyond subsidy – the governance factor

It is essential to examine investments in renewable or solar energy, to assess how their communication affects a given social group and in what ways such communication affects renewable/solar energy-related decisions made by that given group. As has been formulated by [20], “The existence, lack, number, composition, applicability and value of social relationships exert a fundamental influence on the every-day life of an individual or that of a community” [20], by which these factors have important implications for the spread of environmentally conscious patterns including also the advance of renewable/solar energy investments. Consequently, where there are intense social relationships (e.g. typically the interaction between small groups or between small communities), solar energy investments by individual actors more significantly affect other actors’ decisions [1]. With regard to environmental policy and the efficient utilisation of renewable energy, a necessary but not sufficient condition is constituted by the existence of regulatory and legal framework. Efficient environmental policy requires a decision-making mechanism which may be framed in terms of a suitable system of methods and procedures, an extensive pool of knowledge, and mutual consultation. The facts concerning occasional delays in strategic planning, the unpredictable nature of opportunities opened for the submission of project applications and uncertainties about how long such opportunities are kept open or delayed approval of production permits indicate that in Hungary, for the past few years no real improvements have been made either in the field of environmental policy planning or in renewable energy planning [17].

If we are going deep, and we try to analyse (especially small scale) investments, we have to focus on local level as well. It is a statement of fundamental fact that the development of a settlement substantially depends on the personal competence of decision-makers, settlement leaders and that of the actors present in social networks. “In relatively large settlements, there is always a complex organizational base present in the background of personal dominant influence” [21]. “The smaller a village, the more dependent its success is on the local government, the capabilities of the mayor and his/her ambitions” [22]. The lower the level of development, the more decisive the role of the individual is. Consequently, from an environmental policy point of view, taking active and effective actions is regarded as an unavoidable responsibility to be assumed by local actors [1].

According to formerly made interviews on local level in order to reveal social background of renewable small scale investments, we have found transparency level in terms of renewable energy is low while the institutional system seems to be rather politicized (in Hungary and in Croatia as well). There is only limited presence of objectivity and expert knowledge, which leaves a lot to be desired in this area. A conducted public survey also concluded that factors underlying motivations to use renewable energy have their basis in conventions (especially in Hungary) and in economic considerations. In Croatia and in Hungary level of environmental awareness is lower than the EU. Local photovoltaic investments hardly influence renewable energy utilisation of a given community, for the time being such investments have no measurable impact on the population's environmental awareness [1].

4. Conclusions

As it can be seen, the increase of PV investments, in other words, investments into sustainable energy use, and into our environment depend mainly on governments" subsidy policies. As the examples show, a very supportive policy can cause boom and can go hand in hand with widespread negative impacts, the result and the path is not unambiguous. To achieve the goals of EU2020 in order to reduce CO2 emission we should support renewables, but taking into consideration spin-off affects. Beyond these economic factors we have to bear in our mind, that societal elements has also as crucial as economic ones in achieving the before mentioned targets.

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6. References

[1] Varjú V.: Social factors. In: Pelin, D.; Šljivac, D.; Topić, D.; Varjú V. (eds.) Regional Impacts of Different Photovoltaic Systems. Pécs: Publikon, 2014.
[2] Sarasa-Maestro, C.J.; Dufo-López, R.; Bernal-Agustín, J.L. Photovoltaic remuneration policies int he European Union. *Energy Policy*, (2013) 55; 317-328.
[3] Avril, S.; Mansilla, C.; Busson, M.; Lemaire, T. Photovoltaic energy policy: Financial estimation and performance comparison of the public support in five representative countries. *Energy Policy*, (2012) 51; 244-258.
[4] Pelin, D.; Šljivac, D.; Topić, D.; Varjú V. (eds.) Regional Impacts of Different Photovoltaic Systems. Pécs: Publikon, 2014.
[5] Dusonchet, L. & Telaretti, E. Economic analysis of different supporting policies for the production of electrical energy by solar photovolaics in eastern European Union countries. *Energy Policy*, (2010) 38; 4011-4020.

[6] Jenner, S.; Groba, F.; Indvik, J. Assessing the strength and effectiveness of renewable electricity feed-in tariffs in European Union countries. *Energy Policy*, (2013) 52; 385-401.

[7] Campeanu, V. & Pencea, S. Renewable energy sources in Romania: from a „paradise" of investors to a possible abandon or to another boom? The imapct of a new paradigm in Romanian renewable sources policy. *Procedia Economics and Finance*, (2014)8; 129-137.

[8] Sivek, M.; Kavina, P.; Maleckova, V.; Jirásek, J. Czech Republic and indicative targets of the European Union for electricity generation from renewable sources. *Energy Policy*, (2012), 469-475.

[9] Energy Regulatory Office 2009-11: Annual data summary of electric power system of the Czech Republic, Prague.

[10] ERÚ 2014: Yearly Report on the Operation of the Czech Electricity Grid for 2013, Prague.

[11] ERÚ 2011: Price decree 5/2011. Energeticky Regulacní Úrad.

[12] Horeczki R. Fotovoltaikus rendszerek fejlődése a környező országokban – Románia és Szlovákia. In: Varjú V. (szerk.): *Napelemes energia és környezet*. Pécs-Osijek: MTA KRTK RKI-ETFOS, 2014; pp. 107-113.

[13] Csikósová, A.; Antosová, M.; Senová, A.; Culková, K. Economical analysis of the photovoltaic systems – Case study Slovakia. *AASRI Procedia*, (2012), 2; 186-191.

[14] Al-Mansour, F.;Sucic, B.; Pusnik, M. Challenges and prospects of electricity production from renewable energy sources in Slovenia. *Energy*, http://dx.doi.org/10.1016/j.energy.2014.04.106

[15] Knez, M.; Jereb, B. Solar power plants – Alternative sustainable approach to greener environment: A case of Slovenia. *Sustainable Cities and Society*, (2013) 6, 37-32.

[16] Tapurica, O.C.; Tache, F. An empirical analysis of the projects aiming sustainable energy development (SED) in Romania. *Renewable and Sustainable Energy Reviews*, (2014) 37, 13-20.

[17] Varjú V. (ed) *Napelemes energia és környezet*. Pécs-Osijek: MTA KRTK RKI-ETFOS, 2014.

[18] Lalic, D.; Popovski, K.; Gecevska, V.; Popovska Vasileska, S.; Tesic, Z. Analysis of the opportunities and challenges for renewable energy market int he Western Balkan countries. *Renewable and Sustainable Energy Reviews*, (2011)15, 3187-3195.

[19] Suvák A. A fotovoltaikus energiatermelés jogszabályi és intézményi háttere Magyarországon és Horvátországban. In: Varjú V. (ed.) *Napelemes energia és környezet*. Pécs-Osijek: MTA KRTK RKI-ETFOS, 2014, pp. 73-83.

[20] Csizmadia Z. Társadalmi kapcsolatok a szlovák-magyar határtérségben. *Tér és Társadalom*. (2008), 3. 27–50.

[21] Pálné Kovács I. *Helyi kormányzás Magyarországon*. Budapest–Pécs: Dialóg Campus, 2008.[22] Faludi E. Aprófalvak együttműködési formái Baranyában. In: Kovács T. (ed.) *III. Falukonferencia. A mezőgazdaságtól a vidékfejlesztésig*. Pécs: MTA RKK 1995, 380–384.