amorphous silicon panels – 9.4 cents (13.4% reduction) – and Panasonic panels – 10.16 cents (6.2% reduction) – are applied.

Since the return on investment and price regulation (with special regard to Hungary) encourages capacity installations aimed primarily at satisfying energy needed for self-consumption, we performed calculations also for bit higher capacity (5 kW) home system investments (which, naturally, entail smaller investment costs but also result in smaller revenues). According to our calculations, all this does not affect the selected and/or recommended technology in view of profit, net present value or specific cost indicators. Although real profit analysis ranks T3 (CIS) panels the first place in both countries, payback time, net present value and the LCOE indicator constitute a clear argument for the installation of monocrystalline panels. At the same time, with regard to all the technologies applied, calculating with 10 kW (which is quite common in Croatia as it is the up limit of the highest incentives) in Hungary the installation of a relatively small capacity causes a decrease in average payback period whereas such installation in Croatia entails an increase in average payback period, viz. the gap depicted by figure 3 is narrowing. In Croatia, due to a uniform tariff of 1.400 EUR charged for network connection, the unit cost will become higher than it is in Hungary. Naturally, tariff levels are dependent on the location relative to the geographical and network infrastructure of the energy producer but on average, we can use this value as the basis for our calculations. Given a capacity of 10 kW, the expected average payback period of 10-12 years increases to 14-16 years obtained by halving capacity, whereas in Hungary the installation of a relatively large capacity results in an expected average payback period of 18-23 years, a period which, if 5 kW capacity is applied, is expected to decrease to 16-19 years. In Croatia, installed capacities being halved drives down unit costs which, in the case of monocrystalline systems representing the most widely recommended technology, produce a cost ratio of 61%.

EN_10. SOCIAL IMPACTS

When considering the impacts of solar energy utilization, it becomes inevitable to also pay substantive attention to the assessment of its social impacts. More particularly, 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[27].

As has been formulated by Csizmadia (2008), "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" (Csizmadia 2008, p.27), by which these factors have important implications for the spread of environmentally conscious patterns including also the advance of renewable/solar energy investments (in addition to the economic and other framework conditions (Varjú (szerk.) 2014). 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.

Change in the intensity of social publicity can be brought in parallel with the expansion of public infrastructure as well as with the professionalisation of and structural change in such

[27] Social framework conditions for solar energy investments have been delineated in an earlier piece of work (Varjú (szerk.) 2014

expansion. All these processes have become even more intense by the increased use of mass communication devices (Habermas 1999). Publicity plays a significant role in strengthening the above impacts and in raising public awareness. Publicity along with interactions based on social relationships plays a role of impact intensification although to a lesser extent. Olson wrote in his enquiries that "relatively small" – "privileged" or "medium-sized" – groups are more efficient than larger ones (Olson 1997, p. 72).

Although, Olson's experience is primarily based on groups of 5-8 members, our participant observations can also give evidence to the efficiency of privileged groups especially when this is associated with economic rationale and individual interests within the group while not being exposed to conflicts of interest or competitive situation. A typical group like this is represented by BNI (Business Network International) which organizes market actors of different profiles into one group including one actor from each sector. Actors present in the action arena use their own network and offer it to members of the group in a way that they do not derive direct profit. Members of the networking group develop business relations which facilitate them to use other members' network without having to pay commission fees. Therefore, network capital in itself is considered fully convertible and non-sectoral in character. Acting as observers participating in a group like this, we can see no challenges that would practically hold back the advance of small-scale PV investments. Confidence (matched with economic deliberations) vested in the institution, group and in the members of the group has its impact felt without showing any fluctuations. The content of the conversion with the distributor[28] of PV systems shows that, the aforementioned impact is underpinned also by the Hungarian regulation system since this system means an advantage for the Hungarian population. In relatively big categories or in countries where feed-in tariffs are typical also at retail level (e.g. Croatia), the system is in favour of owners and investors. Regarding small-scale power plants, the owner and investor can be the same person but this is not always the case. In this aspect, Hungarian small-scale consumer system excludes speculative capital and shifts priority to considerations related to retail consumption. Another factor influencing spillover impacts is that in Hungary permit procedure (of Eon) is faster than that in Croatia even if sometimes it can reach 143 days, while private investors do not need to wait for quotas to be released (which is the case in Croatia) but after authorization they can launch energy production to satisfy their own needs of energy consumption.

Positive effects of investment incentives, which are created in association with the above mentioned relationship networking, enhance not only the advance of PV systems but also the spread of democracy, i.e. the so-called energy democracy (Béres, 2014), as a consequence of which "fundamental decisions are taken not by energy supply companies but by end-consumers who gain this predominance because they themselves satisfy their energy needs by the application of low-capacity energy-generating equipment purchased by them" (Béres, 2014, p. 205).

We explored motivations earlier in our investigations into the relationship between local governments. Here what we would like to know is how individual organizations influence each other through the dissemination and exchange of their good practices. The main trait of the aforementioned relationships is its ad hoc nature. In case any news comes into the possession of local governments, they may decide to make inquires about it, local governments in charge of implementation provide information but here active/relationship networking effects, which are present in the above referred business sphere, cannot be identified.

[28] -Ex verb: (András Petre, 23.05.2014)

However, local governments have a relatively significant effect on inhabitants. The development of a settlement is highly dependent on the personal competence of decision-makers, settlement leaders or on the interest-based network of local actors. "In relatively large settlements, there is always a complex organizational base present in the background of personal dominant influence" (Pálné Kovács 2008: p. 93). "The smaller a village is, the more dependent its success is on a given local government, on the capabilities of the mayor and his/her ambitions" (Faludi 1995: p. 380). "The lower the level of development, the more decisive the role of the individual is" (Varjú 2014). Interviews made with the mayors within the framework of the project reveal that settlement leaders exert effect on the population and that people also take efforts to follow good examples (renewable energy investments) (e.g. Bóly, Szentlőrinc, Orahovica, where 43 households invested in home system-scale photovoltaic system) consequently, social relationships affect every-day life, which is especially true of relatively small settlements. All that has been said by settlement leaders may have some relevance, still questionnaire brings to light further details concerning the present subject.

In questionnaire survey of population we were interested in whether a PV park, which is established by a local government/private company, exerts any effects on the inhabitants. To this end, we conducted public questionnaire both in Sellye and Orahovica. In the past one or two years a PV park of 500 kW has been put into operation in each of the two settlements. At both locations, investments were made by external investors in co-operation with the given local government by their using a relatively long time frame for preparation in Croatia and a shorter one in Hungary.

Questionnaire was performed through random sampling by selecting a sample of 120 individuals in Sellye and 120 in Orahovica. Questions, on one hand, explored the public's environmental awareness and, on the other hand, they were trying to disclose the impact exerted by the PV park investment. Unfortunately, the project did not imply the possibility of control groups to be asked, consequently we adopted some questions from an EUROBAROMETER[29] research, which we used in our information retrieval also enabling us to make comparisons in terms of the key findings from national research.

Regarding questions eliciting responses concerning approach to the purchase of environmentally-friendly products, in Hungary, according to data from 2012, compared to the EU average (24%), a higher proportion of individuals questioned (31%) said that they frequently purchased eco-friendly products. In both settlements, the figures relating to the responses are much lower than the EU average (Hungary: 11.7%; Croatia: 10.8%), which probably arises from the specific socio-economic circumstances of the given territories and from the comparatively higher proportion of traditional product use. In reference to the two aforementioned settlements, it is obvious that the inhabitants of Orahovica consider themselves more environmentally conscious in terms of purchasing prospective environmentally-friendly products.

Although both power plants have been in operation since 2012, compared with those questioned in Orahovica, a substantially higher proportion of individuals questioned in Sellye have heard about the power plant operating in their settlement. In particular it may be due to the fact that Orahovica is a larger settlement having approximately twice as many inhabitants as Sellye, albeit the PV park in Orahovica is located on the major traffic road passing adjacent the settlement but in Sellye it is in the industrial park which is a less frequented area. However, in Sellye several conferences have been held, with each also

[29] Flash Eurobarometer 367 (2012)

touching on the subject of the power plant, which means that the news has also become more easily available for the inhabitants. This is also shown by the fact that 24% of the respondents in Sellye have already seen the power plant and among others, this is how it became known to them whereas in Orahovica there was no mention of the kind in this context. Twenty per cent of the Sellye respondents have heard of the investment from the mayor or from local government representatives while the relevant proportion in Orahovica is only 10%.

In Sellye 35% of the respondents answered in the positive to the enquiry about whether they use any type of renewable energy sources while the relevant percentage is only 18% in Orahovica. In reply to questions enquiring about the reason, in the majority of cases, they noted the use of wood as a possible renewable energy source which they considered as the most favorable of such energy sources, which can be attributed both to traditional reasons and to easy availability. In Sellye 35% of the respondents use wood, as a contrast, the relevant ratio does not even reach 6% in Orahovica. On the Croatian side, cost-savings were cited as a factor constituting the most common reason. Nevertheless, in Croatia random sampling showed that out of 43 households 28 samples indicated the use of photovoltaic equipment for energy generation. In Sellye there were 5 such respondents.

It appears from the preliminary assessment of questionnaire that, although in Sellye the PV park is known to relatively more inhabitants who at the same time consider themselves more environmentally-conscious, still the power plant of the settlement hitherto has not had any influence on the prevalence of the use of PV cell, while a part of the population say they are planning to adopt renewable energy in the future but only 5 of them have declared that they intend to apply photovoltaic cells. On the Croatian side the number of those who have heard of their solar power station is lower than in Hungary, yet the overall rate of solar equipment usage is high and in view of renewable energy investment plans to be implemented within one or two years (38.3%), 28 respondents think in terms solar panels. In this context it appears that the local photovoltaic investment has no real impact either in Sellye or in Orahovica. Investment incentive in Orahovica is not likely to be influenced by local investment par excellence but rather by a more effective national incentive scheme and faster-than-anticipated returns (see detailed in earlier chapters).

Cross-border investigations give evidence for the fact that the IPA-HUHR program gave fresh impetus to cross-border personal and institutional relations. There are already initiatives relating to renewable energy, however the number of these cases is very small and their multiplying and growth-generating impacts are hardly perceptible. By reviewing the three calls for projects by IPA-HUHR in the period of 2007-13, we can see that existing co-operations continue their mutual work and successful co-operations of this type create the bases of further photovoltaic projects (e.g. SMART WWTP projects. Beyond considerations for the physical environmental and economic points of view, sustainability assessments are also concerned with the issue of human resources. In their ongoing research, Pálvölgyi et al. (2014) carry out assessment studies on the complex sustainability of renewable energy sources (among others also photovoltaic energy production not published as yet). If we go through the set of criteria established by them (Pálvölgyi et al. 2014 p.191), based on our previous experience of and research into photovoltaic energy, we can assess the social impacts as follows:

Table: 20: Potential effects of PV use on the society.

Designation of social indicator	*Expected effect*
Human health	Minimal effects (see detailed in life-cycle analysis)
Quality of life	Due to the sense of independence for the supply system, no or minimal effect
Education, qualification, knowledge	Positive effect, involvement of students into research tasks for the purpose disseminating results
Public awareness, approach, presenting good examples	Positive:
Mitigation of social disparities	Negative impact: Access to PV systems is possible mainly for wealthy people and savings resulting from the use of such systems also contribute to their cost-benefits, thus creating possibility for a further increase in social disparities
Enhancement of co-operation between social actors, strengthening cohesion	Positive impact: see e.g. outputs of current IPA
Prevention of migration (job creation)	Exerting no impact: job-creation effect of PV systems does not appear in a given region (see detailed in the chapter about regional impacts)
Energy poverty alleviation	Positive impact: renewable energy not exploited as yet becomes incorporated in the energy system

Source: Own edition based on indicators by Pálvölgyi et.al. (2014)

As we can see the potential social impacts in the Table 20, it is various. We can find factors where PV use has not or negative influence on the society, especially in the mitigation of social inequality, however it can positively effect on cooperation. In a widely social sense the use of PV combining a good cooperation among actors can become a good-examples, effecting on the settlement marketing.

EN_11. EFFECTS OF PHOTOVOLTAIC SYSTEMS ON REGION – RURAL DEVELOPMENT PERSPECTIVE

No matter whether they supply households and/or business undertakings with energy complementary in nature or, by being in possession of business firms (PV farms), they produce energy for sale, photovoltaic systems are seen as important local energy sources and as such they can exert positive impact on the development of a specific region. Deployment of such systems and/or PV farm investments can take place in urban regions (in the form of investments in brown-field developments in degrading industrial regions and in the area of opencast mines but also in industrial parks located in developing agglomerates or in the form of green-field investments) alongside motorways and in underdeveloped, peripheral rural regions.

Although, the commissioning of such systems also in urban regions (and in developed rural regions or in areas having the potential to develop) can be justified, in certain aspects, innovative developments in economically backward rural areas have relatively higher marginal utility. In resource-deficient rural regions, any (sustainable) developments,