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REPRESENTATIVE PRIMARY RESEARCH ABOUT RENEWABLE ENERGY INVESTMENTS IN CASE OF THE LOCAL GOVERNMENTS LOCATED IN THE MICRO-REGION OF GYÖNGYÖS

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Nowadays, in our current world more and more people are dealing with the usage of the fossil energy that are only available in a limited amount. According to the current situation the usage of the fossil energy is considered as a worldwide issue, for instance, while the amount of the mined (extracted) oil is decreasing, the amount of the new cars are increasing exponentially which also raising the environmental impact, strenghten the greenhouse- and the global warming effect, and these all include more and more inherent risks and unsolved problems. One of the most efficient solutions is to change the attitude of young people toward environmentally friendly lifestyle. The local governments have the other decisive role which takes a huge part of the population's education regarding the environmental awareness because they show the direction by their own example how they can do more to protect their environment. Near Mátra – which is the largest mountain in Hungary – can be found the micro-region of Gyöngyös and it's one of the main characteristics are the extremely clear air, dense forest and the presence of the rich fauna. Thanks to these peculiarity the micro-region is an ideal place for this research. The aim of the research was to create a representative investigation by the help of all the governments in the micro-region of Gyöngyös which provide a comprehensive image about the level of use of renewable energy at the local governments, about their environmentally conscious attitude and their action plans how to enhance this approach by projects, tenders, social media or any other way.

Keywords: Environmental awareness; environmentally friendly behaviour; renewable energy; social media; local government

Introduction

The importance of the environmental protection and awareness are emphasized by more and more country through their decisions made by the government (Kovács, 2010). It was investigated for a long time by now, how the fossil fuels can be replaced by any alternative energy but as the time goes by it is getting more and more clear that the only alternative can be the renewable energy sources which are able to substitute those in the most efficient way (Begley, 2008). It is specific for the rest of the member countries in the European Union that the capitals and their agglomeration areas are able to use the renewable energies in a wider and more efficient way (Boyle, 2012). One of its main reason is the conditions for the implementation of the tenders which often play a decisive role in the level of development in case of some settlements and parts of the country in the area. In Hungary the presence of the facilities specialzed for solar panels, solar collectors and biomass can already be found in more and more settlements as well (Sembery and Tóth, 2004). This research has begun at the end of 2016 in the micro-region of Gyöngyös and its first part was the questioning the elementary and middle school students by the help of primary research. The main aspect of this research has focused on their attitudes toward the environmental consciousness. In the meantime by summarizing the results which has gained from it, the necessity to examine the local governments became clear as well, and the results are summarized in this survey as the second part of the research.

As the Figure 1 shows the Gyöngyös micro-region can be found in the region of North-Hungary close to the capital city Budapest which is 75 km far from there. The area of the micro-region is 751 km^2 and it can be found in Heves County. The number of settlements are 25, in compounds: Gyöngyös is the micro-region's main town, another smaller town is Gyöngyöspata and the rest are villages. The current population is 70.728 and it is continuously decreasing annually by about 750 people. For example, in 2005 the population was 77.249 and because of the capital labour piracy the number has dropped to 71.303 people in 2015. The micro-region situation has changed in the right direction at the end of 2016 because new factories (like Apollo Tyres, Procter&Gamble) and large companies settled in the surrounding area (TeIR, 2018). Since 2005 one of the main issue is in the micro-region that the capital and its agglomeration are close enough to offer more competitive wages for the same type of jobs. Therefore, the actively working part of the population rather choose to commute daily 100 km or even more back and forth than staying in the micro-region to enhance the workforce (Kassai and Ritter, 2011).

In the last primary research, which was about the environmentally conscious lifestyle in case of the elementary and middle school students, the results had shown that it was important to continue this research in the direction of the local goverments as well, because the micro-region's local governments, the university (Eszterházy Károly University), the elementary and middle schools have participated in many green and renewable energy development oriented activities. In most of the projects and developments solar panel installations have been put on buildings (for example: hospital, house of culture, schools, etc.) or biomass recycling has been established (Szeberényi, 2017).

The preliminary researches have also made it possible to narrow the questions and gather more thematic results, complemented by the issues of

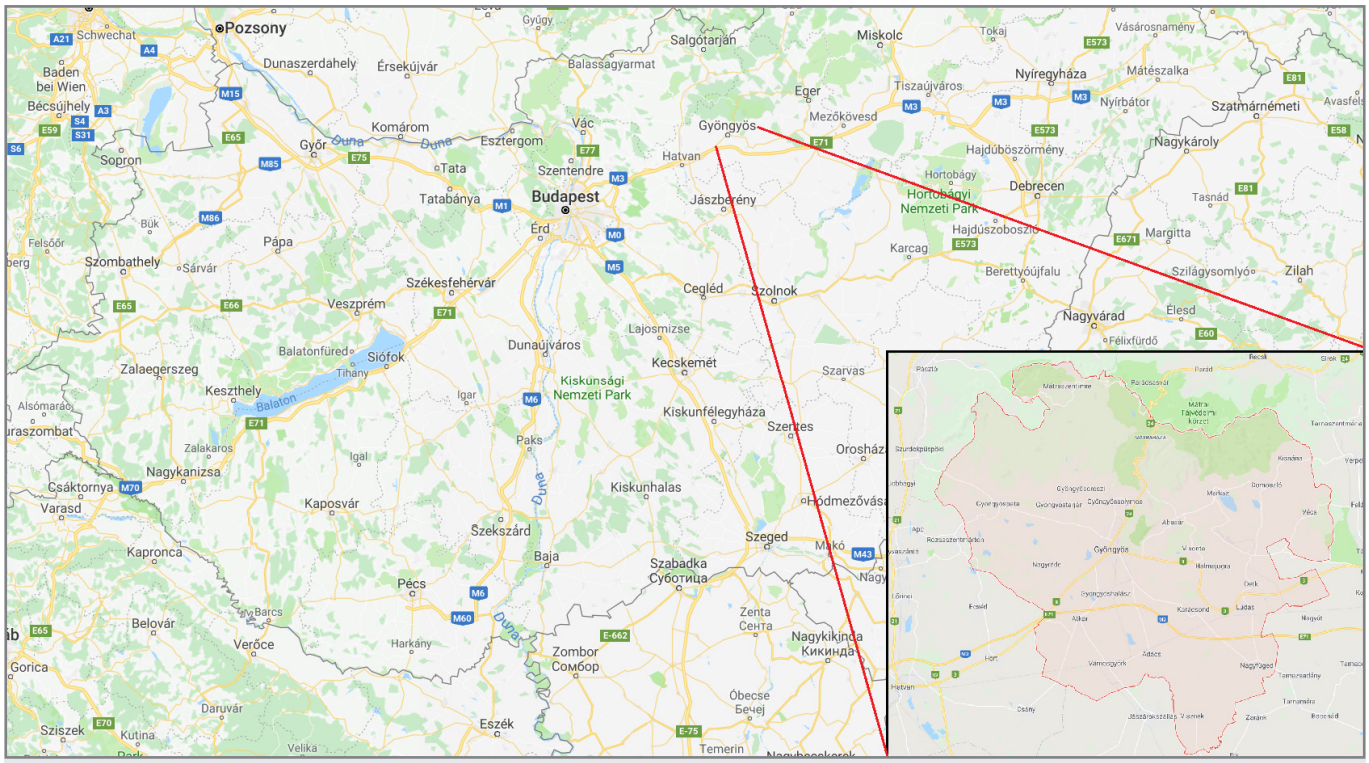

Figure 1 The location of the Gyöngyös micro-region on the map, 2018
Source: Own editing by the help of Google Maps, August 2018

online communication and social media impacts, for instance: how the social media is able to influence the opinion of the younger generations toward to the environmentally conscious lifestyle or the importance of environmental protection.

Material and methods

In the micro-region of Gyöngyös 25 settlements can be found. As the Figure 2 shows there are only 14 local governments which have their own branch offices and there are other 11 which are merged with another local municipality in some form. In the micro-region there are 2 towns (Gyöngyös and Gyöngyöspata), the other 23 are registered as village.

To support the representativeness of the research, a primary questionnaire has been made by the help of 23 questions which were examining the habits of the environmental awareness in event of local governments on several topics. The topics covered by the questionnaire can be divided into the following:

- use of renewable energy sources at local level,
- the type and amount of the funding sources and the return on investments,
- problems with the utilization of tenders,
- future investment plans for energy resources,
- local environmental issues and support,
- implementation of selective waste collection and its problems,
- support of renewable energy projects for the local people,
- use of online communication and social media at municipal level.

In this study an overall representative research has been made in case of all municipalities which can be found in the micro-region of Gyöngyös, to gather as more information as possible about the usability of renewable energy sources, the type and amount of the funding sources and the return on investment, the general knowledge about environmental protection and utility of selective waste collection. Simplicity always a matter, therefore a standardized questionnaire guarantees that the same monitoring process applied to each responding local government. It is the most effective method to gain information in every primary research. All questionnaire was carried out personally at every local government in order to be as informative as possible. The rate of the results is 100% representative because all of the municipalities – which means 25 settlements – have taken part in the research. In case of the consolidated local governments it was necessary to find the major local government and carry out the questionnaires about the others there. The following example can be mentioned: There are 4 villages – Atkár, Detk, Pálosvörösmart, Visonta – from which Atkár, Detk and Pálosvörösmart

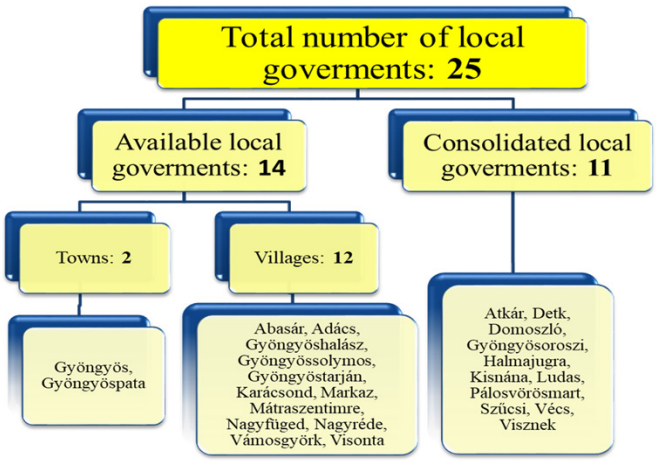

Figure 2 The division of the local governments which were participated in the research, 2018
Source: Own editing based on own primary research, 2018

belong to the major local government of Visonta, hence Visonta had to be asked first to grant permission to the other 3 villages. Because of this process it took several weeks to get into all of the micro-region's local government, receive all of the necessary permissions and make the research.

To help the effectiveness of the primary research three different hypothesis are suggested:

H1: In case of the local municipalities the use of renewable energy sources mostly based on the solar energy.

H2: In case of the local municipalities the renewable energy investments are fundamentally smaller.

H3: The development investments are implemented mainly by European Union tender sources and have a long payback period.

Results and discussion

The first part of the questionnaire focuses on the general use and areas of use of renewable energy sources of the city councils and the council-owned establishments in the district, while it also examines the financial sources for developments of renewable energy sources, the period of time that was needed for the recovering of the investments, the amount of such investments, and the renewable energy-related problems encountered when tendering for or implementing such projects. The second part of the questionnaire investigates the future renewable energy projects, their main motivations, areas of intended use, the amount of investments, and the possible environmental and drafting issues. For further analysis of the topic, it is necessary to take into consideration the local environmental difficulties, the monitoring of groundwater quality, the implementation of selective waste collection, and the analysis of the air quality in the cities of the district, e.g., during heating season. The following figures and tables present the overall results of the research. Table 1 presents the main results from the questionnaire's first question in case of all the local governments found in the micro-region, which was about: "Does the local government (or government-run institution) use one of the following renewable energy sources, and if so, which one?" In case of this question 6 different renewable energy sources have been divided separately or the possibility to choose the "Does not use" option if the local government is not using any of the mentioned energy sources. As can be seen in Table 1, the local governments are using 3 kinds of energy sources from the examined 6 types. In case of place of use the biomass is the most commonly used energy source which is mostly used for heating (Hall and Scrase, 1998) in municipal buildings, health houses, elementary- and middle schools, medical stations and in integrated community and service spaces. If we mention the medical stations as an example, nearly 5~10% of their heating is solved by wood pellets, or the usability rate of wood chips in kindergartens are working very effectively. Two kind of facility – according to 3 local governments – are currently using biogas in wastewater treatment plant and swimming pool buildings. The other and in the same time the one of the oldest renewable energy used is the solar energy and its tools: the photovoltaic solar panels and thermal hybrid solar collectors. It is important to make a difference between these two – as it is, the solar panels primary function is to absorb sunlight as a source of energy to generate electricity, and the task of the solar collectors – which are sometimes known as PVT systems – that convert solar radiation into thermal and electrical energy (Nathan, 2007). The results of the study shows that the solar panels and collectors are used mostly in kindergartens, elementary schools and municipal buildings for one example as the purpose of heating water or the operation of light sensors. From the 25 asked local governments, 5 do not use any of the energy sources, nor do they plan any future investment. In case of 3 energy resources – which are geothermal, water and wind – none of the local goverments use any and neither have plans to use those in the future due to fund, financial issues or the lack of call for tenders.

Table 1 A cumulative result for renewable energies types used by the asked local governments, 2018

Type of energy source	Place of use
Biomass (fired biomass, gasable biomass, firewood, etc.)	■ municipal buildings ■ mayor's offices ■ health houses (wood chips, wood pellets) ■ kindergarten (wood chips) ■ castle ■ elementary schools ■ middle schools ■ medical stations (the 5~10% of heating is solved by wood pellets) ■ integrated community and service spaces (wood chips) ■ gyms (built-in heating)
Biogas	■ wastewater treatment plant ■ swimming pool buildings
Geothermal	none
Water	none
Wind	none
Solar	■ solar panels in kindergartens, elementary schools ■ solar panels, hybrid solar collectors in municipal buildings for the purpose of heating water
Does not use	■ 5 municipalities

Source: Own editing based on own primary research, 2018
n = 25

To determine the necessary amount of investment of the local governments it was required questioning what kind of financial sources have been used to be able to accomplish the developments. In the micro-region 25 settlements can be found and from these, 20 are using renewable energy sources in some kind of way, however 5 do not use any.

The results of the Figure 3 show the amount of renewable energy investments implemented in case of the 20 local municipalities. It was an open question, therefore more answers could be given. The sum of the results of the 5 tenders are 100% altogether. In the event of the answers the 20 local governments accomplished a total of 35 tenders which are focused on renewable energy developments.

The 5 tenders are divided into:

1. European Union tender source (23%) → for 8 local municipalities
2. KEHOP application source (14%) → for 5 local municipalities
3. TOP application source (9%) → for 3 local municipalities
4. National tender source (34%) → for 12 local municipalities
5. Source of local governments (20%) → for 7 local municipalities

Based on the results it can be highlighted that 12 local governments used national tender funding sources to execute renewable energy developments, about 34% of the total investments. Some kind of European Union tender source has been used in case of 23% of the investments which affected 8 local governments, and only 7 municipalities were able to accomplish renewable energy developments by the use of their own funding source which is 20% of the total achieved tenders. KEHOP (Environment and Energy Operational Programme) development fund has been used by 14% of cases and TOP (Territorial and Settlement Development Operational Programme) development fund was the least used by only a mere 9%.

The next question was about the renewable energy investments how much time will it take to recover in case of local governments' development. Its summed

results can be found in Figure 4, which points out the division of the Return on Investment where more than one renewable energy investments have been implemented by a municipality, therefore, it is the average of the maximum value of the return on the total investment. Return on investment (ROI) represents the financial benefit received from an investment. Basically it's a measure of what you get back compared to what you put in. It's used in many areas of finance, as well as in business. In business, it is most often used to determine the effectiveness of marking. When it comes to ROI, the goal is to have maximum return for minimal investment (Jack, 1994).

The diagram depicts that most of the return on investment need at least 2 years to be able to recover. The examined 20 local governments which are participated in the research, 1 claimed that less than 2 years required for the given renewable energy investment to be reimbursed. In case of the other 4 local municipalities this time needs at least 2–3 years, in event of 7 municipalities it is necessary about 4–5 years and for 5 local governments at least 5 years should elapse that the investments could be recovered. There are also some municipalities that say their investments into renewable energy developments will never be recovered.

It is interesting to note that for many small municipalities – according to their own declaration – are very difficult to apply for these renewable energy tenders and development opportunities because their village does not meet many criteria of the conditions in the given application. This is also supported by the fact that no investment in renewable energy has been realized in 5 of the 25 municipalities in the micro-region. Another problem is that for many years there has been a significant lack of specialists who could assist local governments in the installation of renewable energies (such as solar panels, solar collectors) and their maintenance.

Figure 5 shows how large the number of investments already realized in local governments. The question in the questionnaire was made up of 6 responses, of which 5 can be seen in the figure. The last option was "Not planning", but it is not relevant in case of this figure now.

Based on Figure 5 it can be stated that the 40% of the local governments the amount of investments were less than 10 million HUF, which in numbers mean 8 municipalities. In case of 30% of the local governments (6) the amount of investments have been happened between 10 million HUF and 25 million HUF, the next 3 municipalities i.e. 15% of the amount of investments have been implemented between

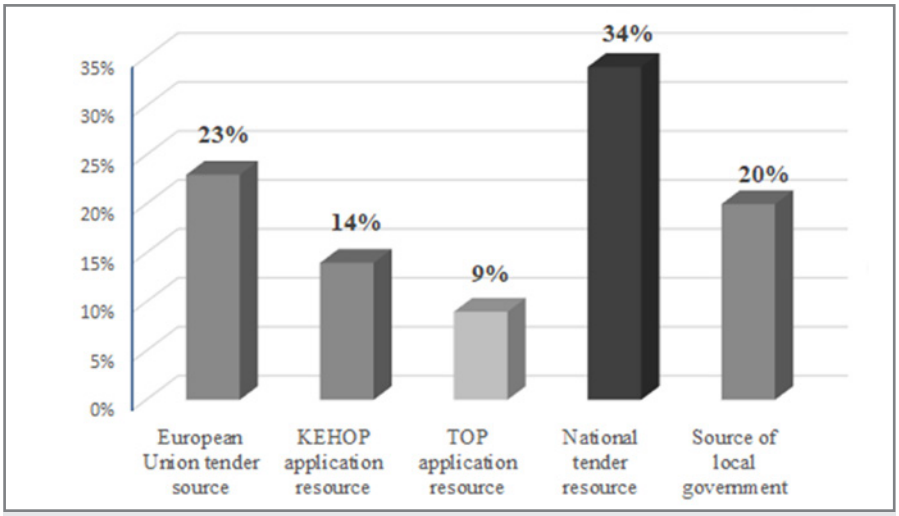

Figure 3 The share of the tender sources types used by asked local governments, 2018
Source: Own editing based on own primary research, 2018
Note: More than one answer could be given to this question!
n = 20

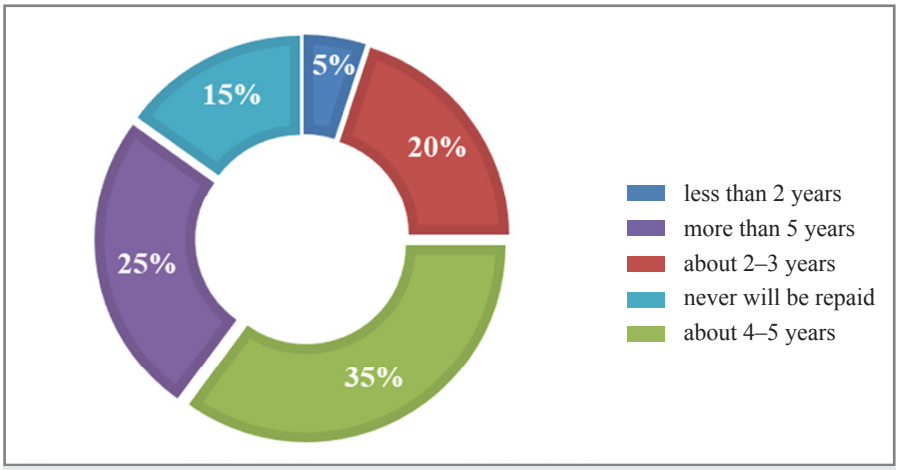

Figure 4 The results and division of the Return on Investment types in case of the asked local governments, 2018
Source: Own editing based on own primary research, 2018
n = 20

25.01 million HUF and 50 million HUF, further 10% of the amount of investmets (i.e. 2 local gov.) have executed between 50.01 million HUF and 100 million HUF and finally for only one municipality was the amount of investment more than 100 million HUF.

Based on this figure, the following question may also be asked about the problems of the use of renewable energies in tenders. In most of the cases, the lack of own resources and financing problems have been highlighted by local governments as a major problem.

Other mentioned issues were the following:

- the lack of public procurement referrals,
- the aforementioned experts and the lack of supervisory work (eg, it can not be an energy producer, or can only be audited by energy analysts at certain times),
- difficulties in eligibility of costs,
- handling the failures of the devices already installed,
- long transaction times in general (can be weeks or even months),
- and the fact that municipalities have a duty to settle each year at the managing authority.

In the next questions the research has focused on future renewable energy source investments in local governments. Questions have been answered on the subject of whether they plan this kind of investments, if so, then what kind of investments are planned, the amount of those investments and where did the idea come from.

The research points out that local governments, although they have a sufficient willingness to plan investments in renewable

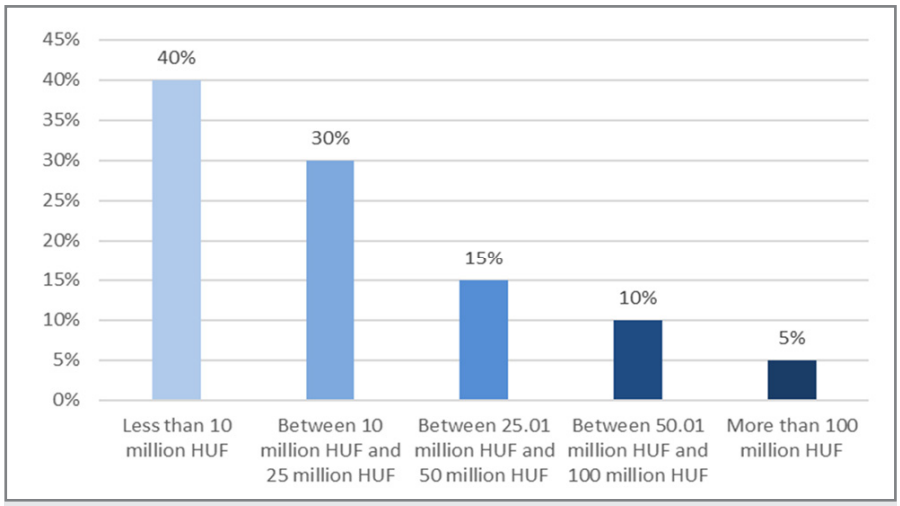

Figure 5 The distribution of the amount of investments types in case of the asked governments, 2018
Source: Own editing based on own primary research, 2018
n = 20

energies, but there are some outstanding problems that prevent this. Some of those problems as an example can be financial issues or the lack of capacity at the local governments. Despite these problems even if we have to count those in, it can be said that the results are quite positive. In regards to the future a wide variety of applications planned for the municipalities, for instance there are several possibilities to apply for geothermal tender from 2019–2020 session, installing solar panel systems, developing the heating of wood with wood pellets in separate medical offices and kindergartens.

Although Hungary has very good conditions for geothermal energy, developments are just beginning to spread in the country in the next years. Therefore, in the event of submitted geothermal tenders (based on the developments in Brussels) 3 different categories can be identified:

Category I: Very shallow geothermics: 5 metres deep or less.

Category II: Shallow geothermics: 50 to 300 metres deep.

Category III: Deep geothermics: more than 1,000 metres deep (Geothermie. Brussels, 2018).

The first two categories – which are more relevant to Hungary as well as in the examined micro-region – include geothermal systems that make indirect use of the Earth's heat. At these shallower depths, the thermal output is not high enough to directly heat a building or generate energy. The 3rd category of geothermal system, on the other hand, can make direct use of the Earth's heat in order to provide district heating or generate energy using a turbine (Mádlné, 2008).

As summarized in Table 2 it can be seen that roughly the avarage amount of investments were between 5 million HUF and 35 million HUF in case of heat insulation, boiler, door or window replacement developments in elementary schools, houses of culture and in kindergartens. Regarding to the biomass investments it can be stated that the avarage amount of investments were between 1 million HUF and 10 million HUF mostly in middle schools, medical stations and health houses. One interesting fact about the wind energy investments is that from those cannot be found in any of the local governments' future plan, in turn the Northen Hungary region would be suitable to carry out wind energy tenders.

Without doubt the most planned investments will be about the deployments of solar collectors and solar panels. This is also demonstrated by the responses of local governments because they plan to invest into solar energy developments an avarage between 2 million HUF and 75 million HUF at as many maintained local government-run institutions as possible. For instance some larger developments – in this case of investment it means more than 30 million HUF – are planned in elementary schools (top of the roof, in the yard, office balconies), in municipal buildings, top of

Table 2 The amount and place of use of investments planned for asked local governments in the future, 2018

Type of energy source	Amount of investment	Place of use
Heat insulation, boiler, door or window replacement:	on avarage between 5 million HUF and 35 million HUF	■ elementary schools ■ house of culture ■ kindergartens
Biomass investment:	on avarage between 1 million HUF and 10 million HUF	■ middle schools ■ medical stations ■ health houses
Wind energy investment:	none	none
Deployments of solar collectors, solar panels:	on avarage between 2 million HUF and 75 million HUF	■ elementary schools ■ municipal buildings ■ towns/villages' main square ■ medical stations ■ parks ■ health houses ■ kindergartens ■ house of culture
Others: installation of LED light systems	on avarage between 500 thousand HUF and 3 million HUF	■ elementary schools ■ middle schools ■ kindergartens ■ parks ■ main squares

Source: Own editing based on own primary research, 2018
n = 25

the health houses or house of culture. In general terms, these buildings have a greater chance of winning the announced tenders.

Another mentionable future investment is the installation of LED light systems in elementary- and middle schools, kindergartens, parks and the villages' main squares. The local governments are planning to spend about 500 thousand HUF to 3 million HUF for as much as the tenders allow the participation. If we think it over the development and use of these sources can enhance diversity in energy supply markets, make a contribution to the reduction of local and global atmospheric emissions, as well as creating new job opportunities in specific rural areas (Akella et al., 2009).

Conclusions

Based on the above studies and primary researches it can be concluded that the promise of renewable energy has now become a reality. In case of the examined local governments of the micro-region which are located in the northern part of Hungary can be stated that the most commonly used renewable energy sources are the solar photovoltaics and the biomass. While in other countries in the event of usage of renewable energy sources are already experiencing rapid sales growth, declining capital costs and its performance increases, in Hungary we are still behind in investments – Budapest is the exception from this.

To help the effectiveness of the primary research 3 different hypothesis were suggested. Based on the results it can be stated that the H1 – "In case of the local municipalities the use of renewable energy sources mostly based on the solar energy" – is only half true because the results show the solar energy as much used as biomass at the time of the research. However, more solar energy developments are planned in the future than biomass.

As the Figure 5 depicts most of the amounts of investments are below 25 million HUF. This figure also points out that the 40% of the amount of investments were less than 10 million HUF, 30% was between 10 million HUF and 25 million HUF and the others were more than 25 million HUF. Only the 15% of the developments are more than 50 million HUF, in this condition it can be stated that the H2 – "In case of the local municipalities the renewable energy investments are fundamentally smaller" – is completely true.

The first part of the last hypothesis (H3) – "The development investments are implemented mainly by European Union tender sources and have a long payback period" – is false because based on Figure 3 the most used source is the National tender source in the 80% of cases, followed by the Europen Union tender sources by 65%. But the second part of H3 is rather true according to the Figure 4 because it confirms that most of the Return on Investments are about 4–5 years (30%), more than 5 years (25%) or there is a possibility that it never will be repaid. About the results of this figure it can be stated that answers caused quite mixed feelings. One of its reason can be that the energy return on investments in case of local governments are quite long, usually at least 2 years but rather 5 or more years before the investment's return. Some of the municipalities which are already using any kind of renewable energy answered that their energy investments have never be repaid and because of this they do not plan to spend further funding sources in this matter. The available sources of the tender can be a minimum of 75% of the total cost, but in some cases the European Union gives support to the financial source up to 95–100%. The conditions which are set out in the tenders determine the amount of the funding source.

This study could present only a part of the research but the figures and tables show how important the environmental and renewable investments are for the local municipalities. The Europena Union and the Goverment of Hungary offer many tender opportunities for developments and investments, but the real question is whether the smaller local municipalities are able to prey on the possibilities for the necessary developments. The National Planning Policy Framework explains that all communities – including the local governments – have a responsibility to help increase the use and supply of green energy. This does not mean that the need for renewable energy automatically overrides environmental protections and the planning concerns of local communities but it is important to plan the concerns of local communities to properly be heard in matters that directly affect them. At present in the event of the examined micro-region in this study the levels of investment in innovation for renewable energy sources are still too low. This has been proved by the Table 1 and Figure 3 too because in the micro-region 25 settlements can be found but only 20 of them have taken part effectively in the research. The rest of the local governments did not make any renewable energy investments by the time of the recent research, some of them are not even able to apply for new tenders in the lack of renewable energy specialists or missing financial resource, therefore these smaller villages have to make effort to cooperating with other villages or micro-regions. Regarding the future it is a must to henceforwardly motivate the local communities, local governments to take part as much renewable energy tender as possible and the knowledge and experience which are attained by these investments have to be shared to the local people. For this, internal resources are needed to help in the developments and investments.

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