Full final report

For the NKFIH project under the number K 116595 entitled

„Role of social learning processes in knowledge related to renewable energy resources in the case of two counties in Hungary"

The first year was used to identify the theoretical framework of the *primary research directions*, *methodology* and *study concepts*, also, surveys grounding the implementation of the above in practice were carried out. On the one hand, a pilot questionnaire pre-survey was carried out among the adult population, which also served the validation of the series of questions we have compiled. On the other hand, as a basis for the school questionnaire study, a word association survey was also conducted among schoolchildren to find out what conceptual background children have. The results of the base studies of both research directions were an important starting point for the representative research conducted in the second year.

One of the basic issues of our research is whether certain geographical aspects, such as landscape types, could be relevant for the selection of municipalities adequate for the two research topics (studying the attitude of the population and learning in school). In relation to the two counties, the most important economic and social data of the municipalities, their geographical location, the region unit they belong to, the typical landscape character and land use were determined. The specific objective of our research was to measure and record the awareness, emotional attitude and activity of the population studied from energy management perspective and to examine whether landscape conditions different by settlement have any impact on attitudes towards energy management.

The selected 6 settlements with different landscape conditions are all villages with around 3000 inhabitants. Based on the size and known parameters (gender, age) of the population of villages in the two counties, quota sampling was applied to ensure representativeness. Random walk was followed in the course of the survey. This random walk was determined using the complete list of the streets of the 6 municipalities (3 municipalities in each county) through which Leslie Kish's systematic sampling method was applied. Individual orientations were measured in three dimensions in the questionnaire. Questionnaire blocks used separate indicators to measure the consciousness/knowledge (cognitive), emotional (affective) and action (manifest) dimensions. In the analysis of the questionnaire, an independence test was performed using the χ^2 test especially the significant relationship between the settlement (as an independent variable and the classic hard variables) and the answers to each question (dependent variables), and then Phi coefficient and Cramer's contingency coefficient were applied to study the strength of relationship between the variables.

The statistical study showed significant differences in attitudes towards energy management in the municipalities. The answers to questions measuring knowledge were significantly influenced by educational level. Responses (knowledge) of those graduated from higher education are independent of the settlement (where they live), while for those with lower education level (primary and sometimes vocational secondary school) there is a significant connection with their settlement in the cognitive dimension. We assumed that the knowledge was influenced by what they see and experience at the settlement (and especially strongly among those with low educational level). More favourable landscape potential will result in greater spectacular use of renewables, which can thus have an (indirect) impact on the development of knowledge of the local population. The recognition of renewable energy resources varies considerably from settlement to settlement, which has not even been influenced by educational level. Landscape conditions alone would not affect the attitude of the inhabitants regarding renewable energy resources, even if spectacular (local government) investments

would be realized using tender support based on it. Attitude related to the management of renewable energy resources would be influenced mostly by educational level. There was a significant connection between educational level and knowledge depth, knowledge origin (school curriculum, television, internet) and the manifesto dimension (how it reduced the household's energy consumption, modernisation plans). Age is basically in a significant correlation with the origin of knowledge. Television, school curriculum and internet sources are more important in the case of younger people.

We have started studies on the emergence of renewable energy sources in education in two main areas. On the one hand, word association analysis among primary school students and, on the other hand, examining the topic of renewable energy in geography education.

Considering the word association analysis, 4th and 7th grader students (174 students) of four primary schools were involved (Hajdú-Bihar county: Debrecen, Egyek; Heves county: Eger, Kerecsend). The survey was carried out in February – March 2016. The survey studied the conceptual structure of 4th and 7th grader students related to renewable energy. The primary aim of the analysis was to map the conceptual system and structure of students related to renewable energy, saving energy, and energy management. The method of the analysis was word association test in which four key-terms (stimulus words) were used that appear in both everyday life and school curriculum (renewable energy, energy saving, power plant, heating). Results revealed that terms selected for the topic of energy are very poorly stable in the students, their knowledge is superficial and come from everyday life instead of school curriculum. Research results and experience were used in our later school attitude study related to renewable energy.

The occurrence of renewable energy as a topic was studied based on the *analysis* of documents regulating the different levels of education. The analysis included *environmental studies* and *nature studies subjects* as well in which geographical knowledge is present apart from geography. The analysis involved *central* regulating *documents* like the national basic curriculum, framework curricula, geography secondary school graduation exam requirements, as well as, *textbooks* and *workbooks* at primary and secondary school level (environmental studies, geography for 5-8 graders, geography for 9-10 graders). According to the publishers publications of Institute for Education Research and Development (20 publications), Mozaik (4 publications), Apáczai (1 publication), Pedellus (1 publication) were examined most frequently. Documents were analysed using the method of keyword search in relation to the renewable energy resources topic. The searched key-terms included: energy saving, heating, power plant, conscientious energy use, energy consumption, energy efficiency, energy crisis. The analysis was completed by an aspect study of the context of the key-terms: it was studied whether key-terms appear purely as knowledge elements or there are attitude, view or responsibility elements associated with the key-terms as well. In conclusion, terms related to renewable energy occur in small numbers in the studied documents. Conscientious occurrence at system level is also missing and contextual elements can be found in the texts only in implicit form.

Research results in the first year were presented at meetings organized in Hungary (Hungarian Geography Days 2016, Environment and Energy in everyday life, Hungarian Conference on Educational Research – HuCER 2016, 1st International Environmental Education Conference IEEC 2016) and were published in Hungarian publications in Hungarian.

Regarding personal changes, the researcher employment planned in the second phase of the work took place earlier, in the first phase. The original starting date of the project was set at 1st September 2015 but this was modified to 1st February 2016. Since the primary research topic of the study is directly related to school activities, the modification in the researcher employment was necessary due to the preparations for the analyses in the first semester of the

academic year 2016/2017. Based on experience in the first year, involving a colleague (Mrs. János Bartha) in the project who had great experience in teaching environmental and nature studies became necessary due to the dominance of primary school studies in the analyses related to education. The modifications mentioned above were requested in writing corresponding to the specifications and these requests were duly confirmed.

In the second year of the project the large volume questionnaire survey for studying the attitude of the inhabitants was carried out. Representing the number of the settlements and the ratio of the inhabitants living there according to the categories of the given LeaRn Index, *the sample contained 542 respondents in 11 settlements in Hajdú-Bihar county and 525 respondents in 12 settlements in Heves county, i.e. 1067 respondents in total*. Further representativity was ensured by dividing the composed sample by gender and age. *As a result, respondents represented the inhabitants older than 19 years of the settlements in the counties according to their gender and age distribution and also to their categorization based on the LeaRn Index of the home settlement*. The questionnaire survey was conducted in July-October 2017. The formerly applied method was used in this survey as well completed with experience from the pilot survey made one year earlier. For the evaluation of the questionnaires and the construction of the database the already mentioned methods were used.

Corresponding to the work plan the planned prominence analysis of those involved in social learning (municipality leaders, influencers) was also carried out in the case of settlements involved in the attitude study. As a first step, the questions of the prominence interviews were compiled then valuable information was obtained via a personal meeting. In total, 27 people were contacted in the two counties involving mayors, notaries, institute leaders, entrepreneurs, and civil organization representatives as well. Based on the results of the prominence analysis, most settlements currently approach renewable energy utilization from the aspect of technical development induced by the central government placing the development of the energy consciousness of the inhabitants into the background. This can be explained by the socio-economic-political system in which the above municipalities exist with an extremely centralised view taking no account of the specific conditions of the local level and providing financial support from higher political levels. It is vital to consider and use local specifics and local resources in a much more conscientious way in the future in order to reduce energy dependency and protect the climate.

Carrying out the qualitative surveys in schools associated with the research was scheduled for 2017. The survey targeted 4th and 7th grader students in primary school and 11th graders in secondary school. When selecting the level of education, the grade directly preceding divided education in primary school (grade 4) and grade 7 were chosen. Grade 11 represents the time period following geography education that has a significant role in teaching the topic of the research.

The most important aspect in selecting the institutions was comparison based on mathematical and literature and grammar competence measurements (this overshadowed regional representativity). In our opinion, it is worth studying the relationship between performance at competence measurements and the level of knowledge related to renewable energy production. In the course of the preliminary work, specific questionnaires for the given age groups and the topics of the qualitative (teachers and prominence) deep interviews were prepared.

Carrying out the questionnaire survey shifted to the end of 2017 therefore comprehensive data collection was changed to the beginning of 2018 due to several reasons. The most important aspect was to choose a date with the least disturbing effect in the life of schools (extra task). We wanted to avoid the very busy period of end term (obtaining final grades, grading conferences, etc.) that is why the calmer period of February-March was selected as a

modification. This modification was also made necessary by the widespread maintainer background. As the sample included church (several types), foundation and school district supported institutes separate permission procedures were necessary and that required time resulting in a shift of the schedule of the project. Research results in the second year were presented at the Hungarian Conference on Educational Research – HuCER 2017 in several presentations.

The third year of the project was started with the school survey. The distribution of the 1588 students involved in the survey was different by counties and settlement types with the following figures: *grade 4*: 580 (H-B. county: 329, H. county: 251); *grade 7*: 628 (H-B. county: 354, H. county 274) and *grade 11*: 380 (H-B. county: 138, H. county: 242). The method of the questionnaire survey was paper based with self-filling responses. Questions were composed with several aims in mind in order to enable us to make not only exposing but comparative analyses as well. The primary aim was to obtain a picture about the knowledge of students in public education related to renewable energy resources and also about the sources of this knowledge. One segment of comparison is comparison with textbook analysis results and the other is with the public questionnaire survey results. In order to perform the above analyses the elements of the textbook analysis and the public questionnaire survey were considered adjusted to the age specifics of the studied age group regarding the intelligibility and methodology of the questions.

Following the processing and analysis of the data it can be stated that *schools as secondary platforms have a significant role in shaping knowledge and behaviour. This role is mainly controlled by teachers who still rely fundamentally on textbooks*. Consequently, it is essential to see what appears in the curriculum in order to strengthen environmental consciousness and sustainability.

In 2018 the research was continued based on the two public questionnaire surveys (involving 300 people in 2016 and 1067 people in July-October 2017). Results of the earlier survey were presented in lectures and publications while the above mentioned statistical analyses were performed on the results of the later survey and the results have been prepared for publication. In conclusion, it can be stated that *the differences of regional conditions in Hungary do not influence the attitude towards renewable energy resources*, not even in the case of extremely high regional potential. Still, the statistical analysis revealed significant differences among the studied settlements since not only regional conditions but the highest educational qualification of the inhabitants was also different. *Knowledge related to renewable energy resources was influenced most by the level of educational qualification together with local experience*. In settlements where renewable energy resources are used and locals know about it and some kind of a knowledge transfer is connected to it (in which the role of friends and family members cannot be ignored) the knowledge of the inhabitants was much more accurate in the field.

Research results in the third year were published in both Hungarian and English publications and were also presented in conferences organized in Hungary and abroad.

Conferences in Hungary:
– *Environment and Energetics. Effective production, conscientious use*
– *IX. Hungarian Geographical Conference*
– *XVIII. National Conference of Education Science*

International Conferences:
– *6th Sustainable Development Conference [SDC 2018], Bangkok, Thailand*
– *The 13th International Conference of ESSS - Management of Water and Soil Resources under Global Climate Changes, Dokki, Giza, Egypt*

– *2nd International Conference on Sustainability, Human Geography and Environment 2018 (ICSHGE18), Kraków, Poland*
– *New Horizons for Cities and Regions in a Changing World, London, United Kingdom*
– *VI. Conference on Education Science and Teaching Methodology, Štúrovo, Slovakia*

At the end of the third year the extension of the project without financial support was initiated. The request was justified by the fact that relevant parts of the research were ongoing. On the one hand, we got the possibility of additional analyses directly relevant to the already obtained results, and, on the other hand, several international conference material and journal publications were under preparation. Publications in indexed journals with higher scientific ranking would be published later (due to the review process, corrections, etc.) than the closing date of the project. Thanks to the extension of the project in the extension one year the results of the project were presented at the *VI. Conference on Education Science and Teaching Methodology* and also in high standard scientific journals of the specific field (*Climate and energy governance perspectives from a municipal point of view in Hungary* and the *Primary and secondary school students' knowledge related to renewable energy and its some influencing fators*). *The Differences in attitude and knowledge between. Prominence and Inhabitants Concerning Renewable Energy Issues in Northeast Hungary* is under publication and the publication entitled *Investigation of public attitudes towards renewable energy sources in Hungary* is under modification by the authors based on the review of the editors. A book in Hungarian presenting the entire research was also published, as well as, an electronic publication in English. English and Hungarian publications presenting the research results of the last year and the entire project are in the phase of the last polishing or under publication (*2nd issue of the 2020 Debreceni Szemle*). The Hungarian book summarising the research results were sent to those taking part and helping the project and also to the educational institutes and local governments that may apply the results in practice.