SZENT ISTVÁN UNIVERSITY

Gödöllő

DOCTORAL SCHOOL OF MANAGEMENT AND BUSINESS ADMINISTRATION

THE EFFECT OF THE USE OF BIOMASS WITH THE PURPOSE OF ENERGY RECOVERY ON THE LABOUR MARKET AND COMPETITIVENESS

DOCTORAL (PH.D) THESES

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Gödöllő

2017

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1. THE ANTECEDENTS OF THE WORK AND ITS AIMS

1.1. The topicality and significance of the theme

In the 21st century the lifestyle of people is becoming ever more energy-intensive. In a globalized world significant energy sources are demanded by transport and telecommunications. Given the fact, that the energy resources of the Earth are becoming depleted, it is more and more difficult to cover the demands for raw materials.

The energy-intensive lifestyle places bigger and bigger hurdles in front of us, and it becomes more and more urgent to find a solution to these hurdles. One of these is the energy crisis, which on the one part is shown by the fact that the yearly production of fossil energy carriers exceeds the optimal value, and on the other part by the fact that the majority of the countries of the world have gotten into an import coercion.

In their research Richard Smalley (2005) et al. have ranked the more important challenges which face mankind. Primarily, they thought the provision of energy, water and food supply to be of great significance, without solving these problems, the other problems cannot become manageable either.

In accordance with the results of the research, the experts have already worked out their recommendations regarding how the fossil energy carriers used until now can be replaced.

On the one part one must strive for rational energy usage, on the other part, those environmentally friendly alternatives which could mean a genuine solution to the energy crisis must be brought to the forefront. For the replacement of fossil energy carriers, the application of renewable energy sources seems to be the most promising possibility. With the knowledge of all of these, most countries have already started to change their energy structure, during the course of which they try to increase the proportion of green energy.

The energy crisis, the dependence on import concerns every country on Earth, thus our country as well, due to globalization. Hungary predicates increasingly more considerable in renewable energy sources, and supports with ever greater intensity, the developments which point in that direction. Apart from the rationalization of energy consumption, a great attention is paid to the increase of the renewed proportions, as well as the definition of the national economic level strategy which points ahead to the future.

1.2. The aims of the research

In my dissertation I draw the attention to the significance of renewed energy sources. In my opinion, the maximum exploitation of our country's energy potential is contains great opportunities.

I have supported my ideas about competitiveness with a macro and micro level analysis.

In the research my aims were as follows:

1. The evaluation of the theme specific macro characteristics as well as the market position evaluation of the member states of the European Union and Hungary.

2. The evaluation of the connection between the renewed energy sources and competitiveness.

3. The evaluation between unemployment, innovation, emission and competitiveness characteristics.

4. The analysis of the relevance of an economic type of competitiveness index number.

5. The examination of the energy recovery of the biomass' local particulars, with special regard to the attitude to the theme of the chosen micro region's inhabitants.

6. The analysis of biomass recovery's local employment creating ability.

7. Sketching the basic pillars of a scenario which aims at creating a green and competitive country.

1.3.   The hypotheses of the research

1st hypothesis

> *Based on particular macro characteristics of member countries of the European Union the use of renewed energy resources are significantly connected with competitiveness. The correlation does not necessarily relate to one point in time, but rather it can be more relevantly projected to a definite period. The proportion of biomass however, does not correlate with the extent of competitiveness, as the conditions and the energy structures of the countries differ.*

2nd hypothesis

> *The macro-data of the member countries of the European Union involved in the analysis explain how the competitiveness index changes, on which, beside the proportion of the renewed energy sources has also influence the innovation, the labour market and the given country's GHG emission.*

3rd hypothesis

> *From amomg the variables involved in the macro analysis the proportion of the renewed energy sources, the GHG emission, shows a more relevant connection with the ecological footprint, while the unemployment rate and the proportion of R&D shows a more relevant connection with GCI.*

4th hypothesis

The local authorities in the micro region of Gyöngyös have a positive attitude in relation to the effects of local green energy efficiency. They are committed in changing energy efficiency of the settlement completely and they have already taken the first steps.

5rd hypothesis

According to the local authorities the investments which aim to expansion the biomass dispose employment creating abilities, as a result of which the local employment indices can improve. From among the many favourable effects the continuous increase of number of newly established jobs is outstanding.

2. MATERIAL AND METHOD

Although the theme of the dissertation is rather novel, thus every empirical research or an analysis with multiple variables can have a great significance in the aspect of the future. In my research I have carried out a national economic level meta analysis, respectively, I have examined the attitude of micro regions pertaining to the utilization of renewable green energy on a micro level by using a questionnaire survey.

2.1. Macro level meta analysis

The basis of the national economic level analysis was provided by the double and Multiple variable analysis carried out on the member countries of the European Union. The aim of the research was to measure the changes in competitiveness, respectively the estimability of these, with the help of certain macro variables. The database contained the 5 main variables shown in Diagram 1.
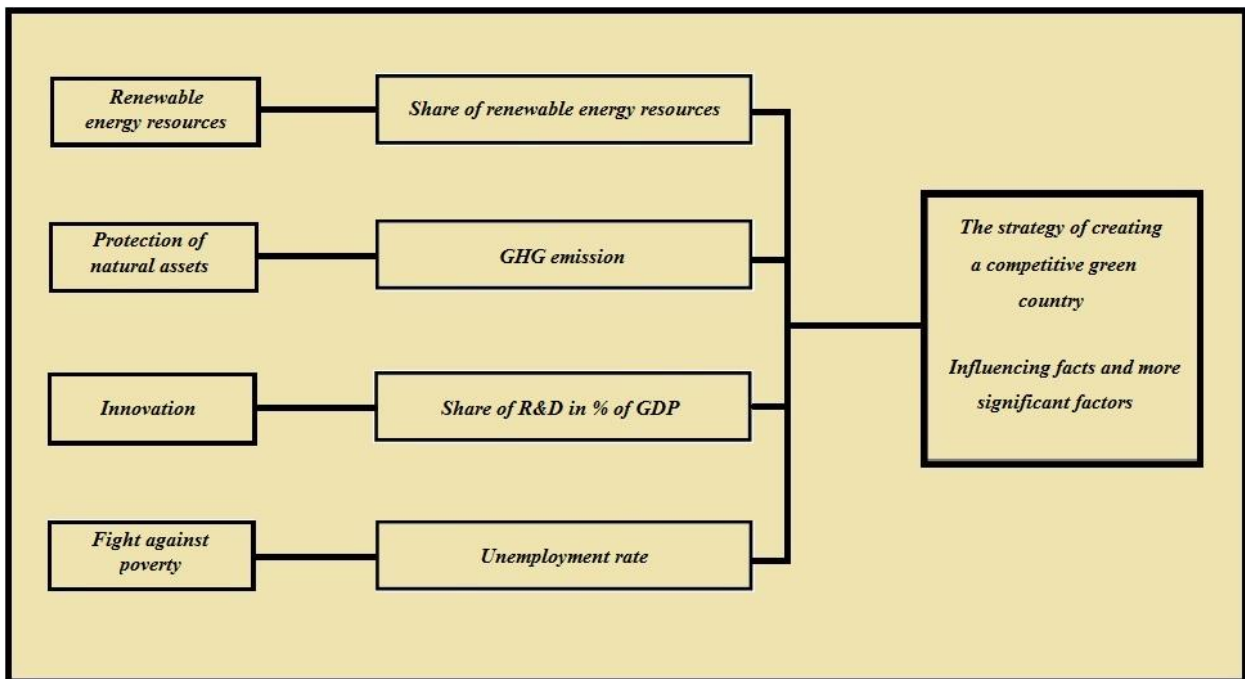

Diagram 1: The four factors established for the analysis of competitiveness

Source: Self-edited

The basic assumption for the creation of the model was that the eventual change in the factors would occur at once, or prior to the change in competitiveness. I have carried out the proportion of renewable energy sources within utilization, the development of the unemployment percentage rate, the R&D's proportion to the GDP and the emission projected per capita by using the data tables of EUROSTAT.

From among the tested competitiveness characteristics, I have collected the competitiveness characteristics pertaining to the GCI from the annual analyses prepared by WEF, while the value contained in the ecological footprint database was analysed based on a statistically derived data.

In the first part of the analytical work I have shown each factor separately. During the course of this it turned out that from among the EU member states the proportion of renewable energy carriers is the highest in Sweden, that in the particular countries the trends of unemployment differ to a great extent, and that only a few EU countries fulfill the innovation aims, and that based on its emission our country can be regarded as an environmentally friendly country. (EUROSTAT 2014, 2015abcd)

Based on GCI we can classify Germany, Great Britain, Finland, The Netherlands and Sweden among the countries which have integration competitiveness-ability. (Schwab, 2014) Based on the ecological footprint the national data of Estonia can be considered favourable, in addition to Sweden and Finland. (TOM-Agency [s. a.], One World – Nations Online [s. a.])

I have named the variables in line with the procedure of the research. In the analysis I applied the following names in every case:

- X_1 the proportion of renewable energy resources;

- X_2 the rate of unemployment;

- X_3 proportion of R&D;

- X_4 GHG emission projected per capita;

- Y_1 GCI;

- Y_2 ecological footprint.

Following the arrangement of the data into databases, I have created rankings, based on which each country got an index number for every factor. I have separated the actual and the indexed data from each other, and I carried out the analysis in this method too.

From the indexed values I have calculated ranking correlation-coefficients per pair, based on which I received information concerning the strength of the connection between the two factors. The formula used for the calculation is as follows:

$$\rho = 1 - \frac{6 * \Sigma d_i^2}{n^3 - n}$$

The factors of influence which occur in the formula are the following:

- d_i = the difference seen between the particular indices of the ranking list;

- n = the number of countries listed in the analysis.

There was no possibility of a higher level statistical examination pertaining to the indexed values.

I have imported the database prepared from the actual figures into the Statistical Package of the Social Sciences (SPSS) labelled with version 22.0, where after the screening of the figures I have made regression calculations. Where I have noted a significant connection between the given factors and the competitiveness indicator, I have tried to create a regressive model containing multiple explanatory variables as well as to examine its relevance.

I have carried out the sketching of the parameters of linear regression along the lines of the usual figures and markings used in statistics.

Regressive equation:
$$Y = b_0 + \sum_{1=1}^{n} b_i * X_i$$

The variables contained in the equation are the following:

- Y = the outcome is varied,

- b_0 = the estimated value of the Y allocated to X=0,

- b_i = the steepness of the linear function, the effect of the unit change of variable i.

- X_i = explanatory variable i.

The testing of the parameters of the equation took place in each case. For the definition of significance I have used the P-value (Sig). Generally, researchers state at a P value of $P<0.05$ that there is a statistically verifiable connection between the two factors, however due to the sample element numbers of this present research I have diverged from this in more case than one. To indicate the strength of the connection I have used the generally applied R-square, (R^2, R-square) the root of which shows what percentage extent the variability of the explanatory variable influences the variability of the result variable.

I have carried out the analysis in several steps. Although I have given more attention to the European Union, I have carried out my first analysis projected on the defining countries of the world. Given the fact that the countries of the integration are rather heterogenic, I found it necessary to classify the countries into separate categories. As a result of this I have created the following groups:

- mini states (the number of inhabitants are less than 1 million);

- small countries (the number of inhabitants are between 1 and 15 million) and

- large countries (the numb15 million).

I have analyzed the groups formed by the GDP and the inhabitants separately. When making the statistical calculations I have disregarded the mini states, and the data points which visibly acted as outliers.

2.2. Micro level analysis

In the integration, most countries, including our country make the emphasis mainly on the utilization of biomass. In our country the proportion of biomass is around 90% within the renewed energy resources, but in similar countries we can also observe a similar structure of energy. There are only a few nations which unambiguously concentrate on other natural resources, and not biomass. (EUROSTAT, 2015e)

In addition to the production volume pertaining to the nations, it is also noteworthy, that the experts predicates great possibilities in the energetic utilization of biomass. In their opinion it does not only stimulate the economy, but through different processes it is also able to increase the standard of living in the region.

In order to verify all of this, I have created a questionnaire survey, in which I have asked the representatives of the local authorities of the micro regions about their experiences and attitude. I have carried out the research in 23 municipalities in the Gyöngyös micro region. When putting the questionnaire survey together my aims were to make possibility of the request for information efficient, to minimize the number of wrong answers, to make processing easy, to get relevant results, and of course to include the basic questions of my dissertation. Beside considering these aspects, I have paid attention to the balance between open and closed questions. The questions which can be answered on the five, seven and eleven scale are easy to process, and at the same time are excellently suitable for measuring the attitude.

The values of the eleven grade scale are close to show the lessons of the set of values behind the answers given in percentage form. With the open questions I had the opportunity to get to know the plans of the local authorities comprehensively, which have helped me to answer the basic questions of the dissertation.

As the first step in the processing of the data I have created a database from the answers given, which I have used Microsoft Excel for. I have prepared the database for analysing importing to the statistics program package called SPPS version number 22.0.

During the processing of the data of the questionnaire survey the descriptive statistical tools has a significant role. The structure of series of questions and the sample element number made it impossible to apply statistical methods with multiple variants in many cases, therefore the application of the potential mean values and the single variable depiction techniques meant the interpretation of the large part of the data. From among the potential mean values average and modus played an especially large role, while the indices characterizing quartiles and assymetry were relegated to the background.

3. RESULTS

The results of the meta analysis and the questionnaire survey have overlapped each other. I summarize the results derived from my research in the following sub-chapters.

3.1. The results of the correlational calculations conserning national economies

The analysis carried out among the countries which are defining on a world-level, allows us to conclude that the countries of the Earth are rather different, thus it may be appropriate to examine a more homogenic community or group. The European Union is more or less homogenic in its geographical location and its cultural pertainment.

During the course of the examinations I have tested the competitiveness index based on the economy first, which I have used the most widely applied index formula of GCI ranging from 1-7 to.

In most part of the analyis I have found no tendentitious connection between the development of the explanatory variables and the GCI in spite of this in Table 1 I have managed to set up a model with which the competitiveness of a given country can be explained.

Table 1: The factors having an influence on GCI (2015) (variables projected on the period of 2010-2013)

Name of variable	b_0	b_1	Sig.	R-square
Proportion of renewable energy	6.456	-1.957	0.197	0.198
Utilization of herbaceous plants (projected per capita)	3.555	0.807	0.324	0.121
Unemployment rate	3.219	1.134	0.011	0.576
Proportion of R&D	6.615	-2.147	0.089	0.320
Proportion of R&D (without outlier)	7.740	-3.263	0.010	0.633
GHG emission	12.221	-7.707	0.006	0.630

Source: Self-edited

According to the analysis carried out among the countries with a low number of inhabitants the data derived after the examination of the period of 2010-2013 have essentially influenced the GCI value of 2015. Statistically, the result variable is relevantly affected by the rate of unemployment, the R&D proportion cleared of the outlier, and the emission of GHG. From among these, the effect of the latter is the most relevant, as based on the data, the changing of emission explains the changing of the GCI approximately up to 80%.

A statistically significant model can be set up from the relevant variables.

$$Y = 12.028 - 2.014X_3 - 5.480X_4$$

Innovation (X_3) and emission (X_4) jointly explain the changing of the 2015 value of the GCI nearly up to 94%.

The two described independent variants proved to be statistically significant (P_3=0,024, P_4=0.012), at the same time the correlation coefficient between them is significantly lower than 1.[1] The estimated GCI value is 4.53 (X_3=1 és X_4=1) projected to countries with stagnating innovation activity, and unchanged emission. According to the regression there is a negative connection between the innovation investments and the GCI, as well as the emission and the GCI, thus we can conclude that the innovation of the small countries worsens the competitive national economy, while the decrease of emission improves it.

The ecological footprint – similarly to the GCI – did not show an essential connection with the explanatory variables. The analysis has shown that in this case as well, it is only a matter of significance of a select few factors, but we can only set up a model with multiple variables if the raw data meet certain criteria.

The 2nd table shows the situation, in which those criteria fulfil which make a regressive model setting up possible.

Table 2: The factors having an effect on the ecological footprint (The variables concerning 2010-2013 period)

Name of variable	b_0	b_1	Sig.	R-square
Proportion of renewable energy	-60.592	62.114	0.011	0.491
Utilization of herbaceous plants (projected per capita)	-49.575	56.043	0.634	0.024
Utilization of herbaceous plants (projected per capita) (without outlier)	-139.705	141.806	0.021	0.509
Unemployment rate	25.162	-17.848	0.572	0.033
Proportion of R&D	-193.942	200.603	0.005	0.566
GHG emission	95.520	-84.688	0.383	0.077

Source: Self-edited

In case of countries with a large number of population, the factors and the ecological footprints have a closer connection, if we apply the average development index for the period of 2010-2013.

The proportion of the renewable energy and amount of money spent on R&D in the proportion of GDP statistically have a significant influence on the ecological footprint. Both variables have a medium strength connection with the sustainability-like competitiveness index. With the use of these two significant variables an equation can be set up, which the development of the ecological footprint can become more predictable with.

$$Y = -158,562 + 11,269X_1 + 150,269X_3$$

The factors included in the triple variable regression model jointly explain the development of the ecological footprint up to 87%. On a 5% significance level both variables can be regarded as relevant. In a stagnating economy the inhabitants need on average three times as much territory

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[1] The unemployment rate is not included among the parameters of the regressive equation, given the fact, that its inclusion would have decreased the effect of the equation with the best explanatory power.

than which is available. R&D and the renewable energy resources both increase the demand for territory.

3.2. The results of the questionnaire survey referring to the attitude of the micro regions

The discrepancies between the municipalities of a given region are rather small, when it comes to competitiveness and social status. Despite this, based on the answers of the local authorities included in the sample, the dispersion of the unemployment rate is significant. According to the responders the catching up of the most disadvantaged regions would be helped the best way by the development of the infrastructure and the modernization of the education system. This latter is a task which needs to be solved in several municipalities, while in the opinion of the respondents it is the social unequality which causes social tension.

The introduction of the energetical utilization of biomass is on the agenda of more and more municipalities. At present a quarter of the respondent local authorities said that they were using green energy. Those municipalities in which the energetical changes have not started yet, they will do so in the near future according to the plans.

The scenarios refering to the future significantly depend on the current competitiveness of the given municipality. (Table 3.)

Table 3: Is there any chance that in your region green energy production will increase significantly? – based on the subjective judgement of competitiveness

Name	Chance within 1-2 years			Chance within 3-5 years			Chance within 10 years		
	Minimal	Realistic	Great	Minimal	Realistic	Great	Minimal	Realistic	Great
Disadvantaged municipality	80.0%	20.0%	0.0%	20.0%	80.0%	0.0%	0.0%	60.0%	40.0%
Moderately developed municipality	100.0%	0.0%	0.0%	21.4%	64.3%	14.3%	0.0%	30.8%	69.2%
Competitive municipality	25.0%	50.0%	25.0%	0.0%	75.0%	25.0%	0.0%	0.0%	100.0%

Source: Self-edited

The significant part of the disadvantaged local authorities (60%) are not sure that green energy production will increase significantly even in 10 years perspectives either. The repondents predict energetical utilization of biomass in 3-5 years in most of the local authorities of the moderately developed municipalities, and nearly 70% of the respondents predict significant change in 10 years. The majority of the competitive municipalities puts the likelihood of the sharp increase of the production volume around 2020, but by the year 2025 every local authority of every municipality included in the sample is sure, that they will utilize green energy in a much greater quantity, than they do today.

As table 4 shows, a significant part of the respondent local authorities believe that the larger volume production of biomass would have a favourable effect on the development of the unemployment rate, for this however, there would need to implement a lot of projects which aim for the utilization of green energy.

Table 4: The effect of a project involving the utilization of biomass on the unemployment rate

The rate of the decrease of the unemployment rate	Minimal expectation	Average expectation	Maximum expectation
1 year on	0%	13.9%	33%
3 years on	1%	25.8%	53%
5 years on	3%	35.6%	67%

Source: Self-edited

According to plans the implementation of the projects would result in a decrease of 13.9%, after one year, 25.8% decrease after 3 years and 35.6% decrease in five years in the unemployment rate. Table 4 futhermore shows that the most sceptical of the respondents do not expect an essential improvement, while the optimistic respondents expect a decrease of 67%. The standard of living in the region would improve if the jobs created by the energetical utilization of biomass would be filled by local inhabitants.

The survey questionnaire has pointed out, that the local inhabitants are mostly suited to fill jobs which require low qualifications. Furthermore the 2nd diagram also shows, that there is a lack of highly qualified employees, therefore people commuting between their home and workplace are be asked to fill the leading positions.
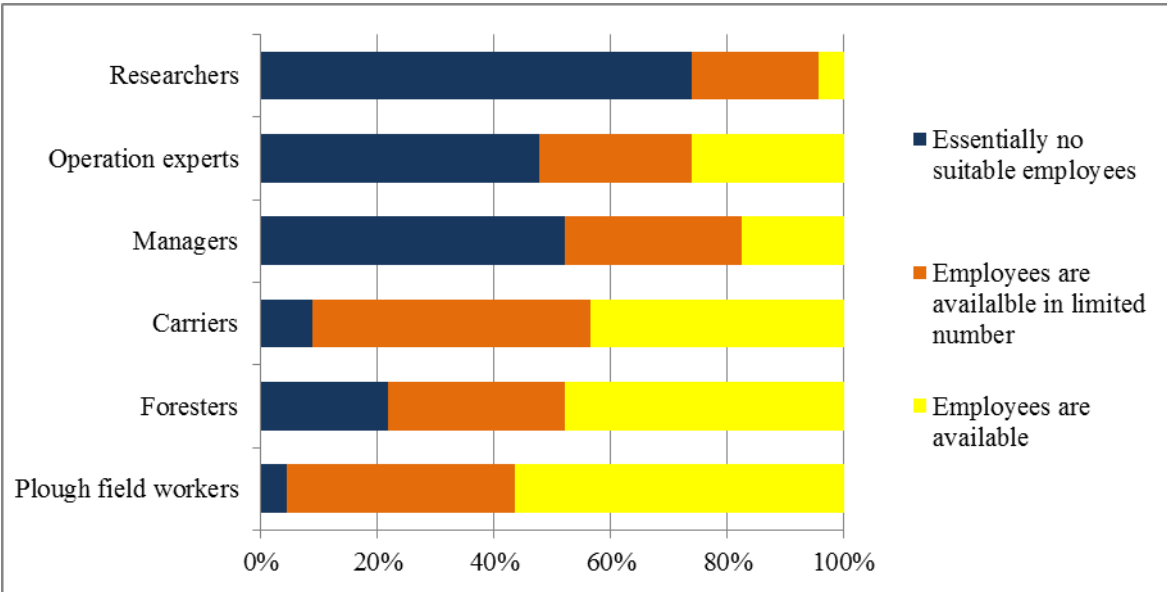

Diagram 2: Is there a suitable employee in the given municipality to fill the particular positions?

Source: Self-edited

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The respondents believe that there is an oversupply in the jobs related to development research mostly.

For the implementation of the projects the full cooperation of the local inhabitants is definitely needed. It is important that the inhabitants of the given municipality feel the causes aiming to ecological changes their own causes.

The 3rd diagram shows that currently the starting companies can anticipate only moral support concerning a project dealing with energetic utilization of the biomass.
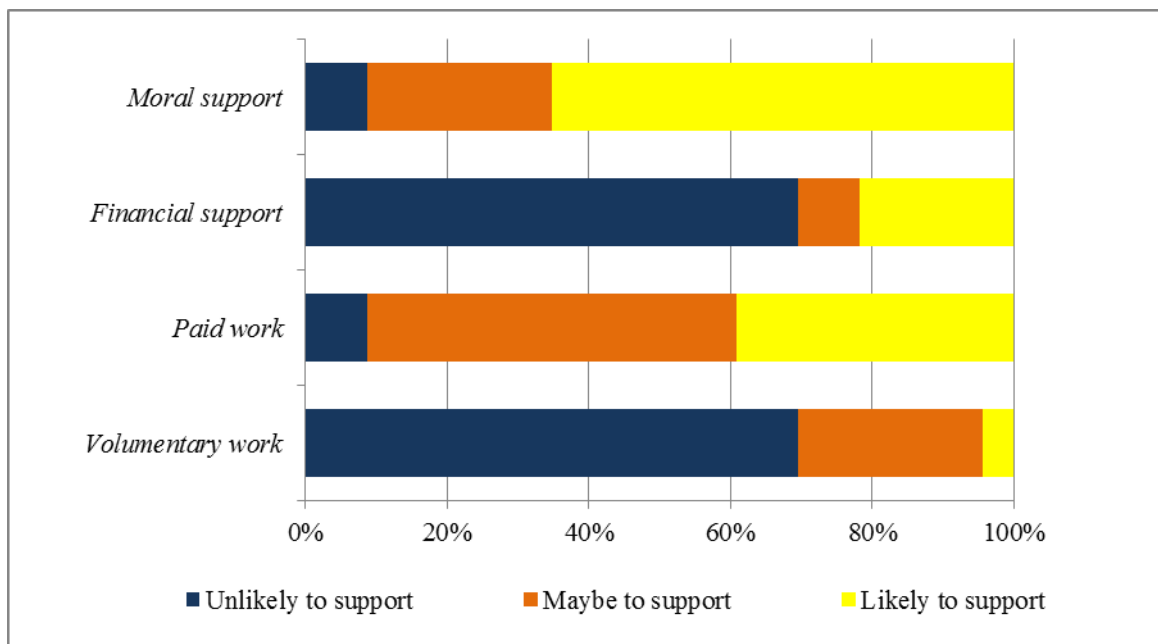

Diagram 3: Social support for the project dealing with the utilization of biomass

Source: Self-edited

Nearly 90% of the respondents believe that the local inhabitants would prefer working in the energy sector, however a lot of them exclude voluntary work and financial support. The data can be seen on the diagram excellently confirm by one of the respondents, who explained the local inhabitants's attitude to the projects to be implemented.

> *„People mostly do not react well to changes, if those do not bring personal benefit directly. In these cases worries they basically do not care about come to the forefront (environment protection, smells) and when they start looking for a problem, they either find a genuine one, or create one."*

In addition to supporting those who live in the municipalities, the cooperation of the central authorities is also important. A significant number of the respondents believed that state and EU fundings are important, however, the attitude of the local authorities also plays significant role in the advancement.

The data in the 5th table show, that the respondents belives the expected effects of the energetical utilization of biomass differently.

Table 5: The proportion of those who agree with the statements concerning the utilization of biomass-based on the subjective judgement of competitiveness

Statement	Disadvantaged municipality	Moderately developed municipality	Competitive municipality
A great attention is paid to the energetical utilization of biomass in their region.	60.0%	14.3%	50.0%
The energetic utilization of biomass has a positive effect on competitiveness.	60.0%	21.4%	75.0%
Biomass as a source of energy may be able to cover the full heat energy demand of public utilities (schools, local authorities...)	80.0%	357%	100.0%
Biomass could support the measures taken to decrease unemployment.	20.0%	21.4%	75.0%
The utilization of biomass could decrease the import dependence of the region.	40.0%	21.4%	75.0%

Source: Self-edited

On the whole the attitude of the local authorities can be regarded as positive, however, it is visible that the moderately developed municipalities have a more negative attitude to the theme of the energetical utilization of green energy. The respondents of this municipality believe that green energy does not help increase competitiveness, it is not able to provide the supply of energy to the public utilities fully, respectively it would not help decrease the dependence on import either. After already having gained some experience the local authorities of the competitive municipalities have a more positive judgement about the energetical utilization of biomass. The majority of respondents have a favourable view of the statement regarding the heat supply to public utilities, the changes in unemployment and the decrease of import coercion.

3.3. The evaluation of the hypotheses

1st hypothesis

Starting out from particular macro indices of the member countries of The European Union the utilization of renewable energy resources has a significant connection with competitiveness. The correlation does not necessarily relate to a given period, but it can be more relatively shown when projected at a definite period. The proportion of biomass however does not correlate with the extent of competitiveness, because the conditions and the energy structure of the countries differ.

Evaluation: Partly accepted

2nd hypothesis

The macro data of the member countries of The European Union included in the analysis explain the development of the competitiveness index, which beside the proportion of renewable energy resources, innovation, the labour market and the given countries GHG emission have also influenced on.

Evaluation: Dismissed

3rd hypothesis

From among the variables the proportion of the renewable energy resources, and the GHG emission shows a more relevant connection with the ecological footprint, while the proportion of R&D shows a more relevant connection with GCI.

Evaluation: Partly accepted

4th hypothesis

The local authorities located in the micro region of Gyöngyös have positive attitude regarding the local effects of the utilization of green energy. They are dedicated to completely transform the energy consumption of the municipality, and have already taken the first steps to do so.

Evaluation: accepted

5th hypothesis

According to the local authorities the investments which aim to the expansion of the biomass have a job creating ability, as a result of this the local employment indices improve. From among several favourable effects the continuous increase of the number of newly created jobs is outstanding.

Evaluation: accepted

4. NEW AND NOVEL SCIENTIFIC RESULTS

I have come to the following conclusions during the research work conducted for the dissertation:

1.   The calculations resulting from the application of rank-correlation and regressive calculations allow us to conclude that there is not statistically significant connection can be shown between the proportion of renewable energy resources and the econonomy-like competitiveness index – namely the GCI. The calculations carried out during the course of the research it was proven that there is a casual connection between the two factors.

2.   Based on the research carried out among the member states of The European Union it turned out, that neither for the small nor for the large countries can such a projective model be set up, with which the competitiveness can be reliably predicted. In addition to the rate of the renewable energy resources, the unemployment rate, the percentage value of R&D expressed in GDP, and the emission projected per capita equally showed a connection with the result variable in case certain criteria were met.

3.   It was confirmed that the GCI is not able to completely measure the development of a given country. The application of the economic featured index is not sufficient for an analysis which is based on sustainable development. For this reason, I have tested another index, which was the ecological footprint, however, this latter also behaved similarly to the CGI. Thus, combinated using of the tested indicators can be suggested fot the complete analyses.

4.   The national economy level dedication shows in the positive attitude of the micro regions, in spite of that, it can be deduced from the data of the questionnaire survey, that the local authorities of the municipalities are heterogenic considering the question. It was proved that a significant part of the respondents believe that the energetical utilization of biomass has a beneficial effect on the indices of the municipality, however, in certain cases they do not share the views, which are predicted by the experts regarding the effect to be expected.

5.   The questionnaire survey has furthermore proved that as opposed to the local authorities the inhabitants only support the plans passively. The starting projects can not really count with financial support and voluntary work. Thus, we can conclude that there is no social cooperation which is needed to expansion of biomass.

6.   In my research it was also proved that from among the advantages connected to the energetical utilization of biomass, the increase in the standard of living may not necessarily come to pass. Mostly, the local inhabitants are only qualified to do seasonal work which requires lower qualifications, however for filling of several positions highly qualified and experienced employees are needed. In the more disadvantaged municipalities, due to the lack of experts, the locals are unable to fill these jobs, so the local effects of the energetical utiliztation of biomass (creation of jobs and increase in the standard of living) fails to meet expectations what we can read in the studies.

5. CONCLUSIONS AND RECOMMENDATIONS

It was concluded that neither the GCI, nor the ecological footprint could measure adequately the sustainability of the given country and determine the green, competitive countries, Thus, I have come to the conclusion, the it seems appropriate to use these two indices jointly similar to diagram 4.
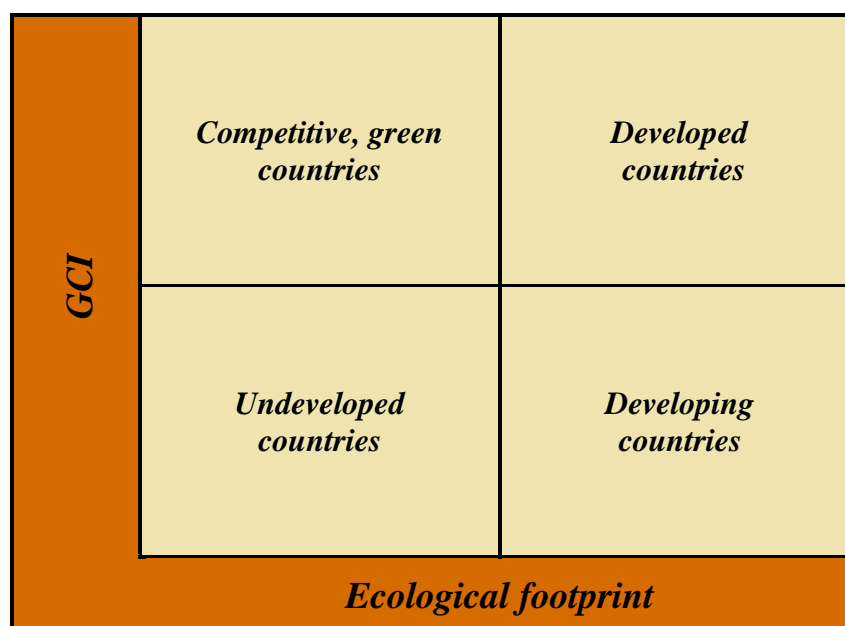

Diagram 4: The phases of the creation of a green and competitive country

Source: Self-edited

- Developing countries: Hungary, Croatia, Romania…

- Developed countries: Germany, England, Belgium…

- Competitive, green countries: Sweden, Finland.

In Europe, the countries of the Eastern region unambiguously belong to the group of developing countries. In addition to our country, Romania and Croatia can also be found in this category. The developing countries try to increase their competitiveness, as a result of which the energy intensive industry branches become stronger, which of course increases the ecological footprint. The superpowers, like for example Germany and Great Britain –are competitive, but they burden their environment significantly. Because of these characteristics these countries can be found in the top right quadrant. The next stage of the development is simultaneous with the implementation of sustainability. The leaders in creation of green and competitive countries have already recognized the methods of establishing long term competition advantages in practise as well. The ecological footprint of these countries is close to 1, which can definitely serve as a good example for our country as well. From among the member states of the EU Finland is unambiguously green, however, so is Sweden, thanks to its macro data, it can be alaready classified into this category. While the Finnish take the 2nd place among the countries analyzed

by WEF, Sweden is placed at number 4. The competition advantage of Finland is further ensured by the working of the education system (1st place) while the position of Sweden is also assured by its ability to embrace technologies (1st place). (Schwab, 2012)

The environmental factors and the applied statistical analyses during the course of the dissertation allow us to come to the conclusion that the mentality of sustainable development must take into the focus. I believe that the scenario which take the sustainablity into focus can be implemented through the aims below.

- Comprehensive aim: the setting up of a model of a competitive green country and green society

- Top aims:

    - the increase of the proportion of renewable energy resources;

    - establishing environmental protection awareness;

    - getting rid of social unequality;

    - the re-structuring of the education system.

It was the emphasized purpose of the dissertation to make a recommendation regarding how the proportion of green energy utilization can be increased within the energy consumption. In my opinion this can only be implemented along a well-worked-out, long term strategy.

The increase the proportion of renewable energy sources, the elimination of disparity and the establishment of environment friendly approach can be realised by accomplishment of long-term strategy.

The defining elements of this are the following:

- change of paradigm, shaping of attitude;

- the inclusion of energetical studies in the curricum;

- practice oriented and loyal human resources;

- the rationalization of energy consumption;

- all the more effective exploitation of the biomass potential;

- to meet with the sustainability criteria (the annual economic growth achieved with the sustainable development in mind, the decrease of emission, biodiversity);

- green marketing: the publication of books, school books, video materials, conference materials, the explanation of research and glossary in simple and understandable language to the public.

The factors defined in long term strategy serve the implementation of the top aims both separately and connectively, which can be share further into mid-long term elements. I believe, that the most important aims may be the following:

- the support of R&D activity and stimulate thedecentralization of workshops;

- the support of investments which promote the green economic sector;

- making the inhabitants familiar with the concept of sustainability;

- establishing environmental awareness responsibility;

- promoting new (green) production technologies;

- ensuring the availability of external requirement (access to legal interpretations and support,…);

- review of The National Basic Curriculum (*NAT in Hungarian*).

6. THE LIST OF PUBLICATIONS PERTAINING TO THE THEME

Scientific book excerpt published in Hungarian
Bozsik N. – Farkas Á. (2010): Economic Studies, College Notes, Chapters 1.5., 1.6., 2.2., 2.5., 2.7.

Publications in periodicals
Foreign language publications
Á. Farkas (2010): Study of young people's wine consumption habits at the Corvinus University of Budapest, Special Issue No 24 of Management 24 (English Special Edition) 2010, Volume 54, pp. 91-97., http://ageconsearch.umn.edu/bitstream/99209/2/FarkasA_2010_24.pdf, ISSN: 0046-5518
Á. Farkas – P. Faragó (2011): The attendance of rational energy utilization and of the green energy, Hungarian Journal of Industrial Chemistry, Veszprém, Vol. 39 (2) pp. 177-181 (2011), http://konyvtar.uni-pannon.hu/hjic/HJIC39_177_181.pdf, ISSN 0133-0276
Á. Farkas – P. Faragó (2011): Thoughts about the clear energy, Hungarian Journal of Industrial Chemistry, Veszprém, Vol. 39 (2) pp. 325-330 (2011), http://konyvtar.uni-pannon.hu/hjic/HJIC39_325_330.pdf, ISSN 0133-0276
Published in Hungarian
Farkas Á. – Faragó P. (2012): On the labour market of the energetic application of biomass with an interdisciplinary approach,Valóság, 2012/9., pp. 21-33, ISSN 0324-7228
Farkas Á. – Faragó P. (2012): The possibilites of increasing green employment Social study Volume 30 Issue 4 pp. 399-409, http://akademiai.com/content/t61wr15q41272k14/?p=5c59efc277dc4548a975109b7c445bc6&pi=6, ISSN 0231-2522
Farkas Á. (2014): Pros and cons about the energetics application of biomass in connection with social effects, Social research: Volume 32, Number 1/March 2014, ISSN: 0231-2522 (Print), 1588-2918 (Online), print: p. 74-82, online: http://www.akademiai.com/content/20v29p24k6709v33/?p=2bee60eb97b04feab6dc8aea2478ed65&pi=5
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Lectures at Scientific Conferences published in conference publications
Foreign language/international publication
N. Bozsik – Á. Farkas (2009): Price competitiveness versus quality marketability or what determines the competitiveness of the wines, Thüringisch-Ungarisches Symposium 2009. August. Jena, Germany, pp. 59-63, ISBN 978-3-932886-21-8
N. Bozsik – Á. Farkas (2009): Stackelberg Duopoly or strategic Game of Competing Companies, Thüringisch-Ungarisches Symposium 2009. August. Jena, Germany, pp. 193-198, ISBN 978-3-932886-21-8
N. Bozsik – Á. Farkas (2010): Possibilities of development of the North Hungarian Region during the crisis, with special emphasis on education, „Economic – social effects of the V – 4 countries entry into the European Union", 2011. május 11-13th May 2011., Kosin (Slovakia), pp. 24-27., ISBN 978-80-89458-21-9
Á. Farkas – P. Faragó (2010): The Hungarian young persons' sport activity, „Economic – social effects of the V – 4 countries entry into the European Union", 11-13th May 2011., Kosin (Slovakia), pp. 34-37., ISBN 978-80-89458-21-9
Á. Farkas – G. Márkus (2011): Are the Hungarian Young on the way to the green future?, ECOCYCLES Handbook. Erasmus LLP Intensive Programme, 15th May-15th June 2011 Gyöngyös, Hungary, ISBN 978-963-9941-23-6
Á. Farkas – G. Márkus (2011): Are the Hungarian Young on the way to the green future?, International Conference on Environmental Technologies. Proceedings, 1-3 June 2011, University of Pannonia, Veszprém, ISBN 978-963-9941-22-9
Á. Farkas – G. Márkus (2011): Green energy on the fields, ECOCYCLES Handbook. Erasmus LLP Intensive Programme, 15th May-15th June 2011 Gyöngyös, Hungary, ISBN 978-963-9941-23-6
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Farkas Á. (2011): The public judgement of alternative energy sources (2010), Economic and Business Challenges in the Carpathian Basin, Sapientia EMTE Miercurea Ciuc Campus, Miercurea Ciuc, Romania, pp. 100-107., Státus Publishing House, ISBN 978-606-8052-52-6
Farkas Á. (2011): The main questions of the productions of energy plants in the Carpathian Basin, Sapientia EMTE Miercurea Ciuc Campus, Miercurea Ciuc, Romania, pp. 108-116., Státus Publishing House, ISBN 978-606-8052-52-6

Hungarian language publications
Farkas Á. (2009): The examination of the competitiveness ability of Hungarian wines after joining the EU, Erdei Ferenc 5th Scientific Conference, College of Kecskemét, College Faculty of Horticulture , ISBN 978-963-7294-73-0
Farkas Á. (2009): More market, more profit, or third grade discrimination on the wine market, Több piac, több profit; avagy harmadfokú árdiszkrimináció a borpiacon, Erdei Ferenc 5th Scientific Conference College of Kecskemét. Kecskemét,College Faculty of Horticulture, ISBN 978-963-7294-73-0
Farkas Á. (2009): Stackelberg-duopoly on the market of the Eger wine region, Week of Science at The College of Dunaújváros 2009, College of Dunaújváros, pp.,ISSN 1586-8567
Farkas Á. (2010): The competitiveness analysis of wines – How can Hungarian wine be more market competitive? 12th International Scientific Days, Károly Róbert College Gyöngyös, pp. 543-549, ISBN 978-963-9941-09-0
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Farkas Á. (2011): The more important question of land utilization with special regard to the energetics application of soil. 17th Scientific Youth Forum Economics and Informatics Section 6.1-6., Pannon University, Georgikon Faculty Keszthely, ISBN 978-963-9639-42-3
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Márkus G. – P. Ábrahám S. – Farkas Á. (2011): Value evaluation of the operation of the Tower Business House owned by multiple joint owners (61) Dunaújváros, College of Dunaújváros, Innováció Innovation and Manangement Centre, „Concord". With science in the terms of economy and society theme, an interdisciplinary conference series held in honour of Hungarian Science DayT pp. , ISSN 1586-8567