

DOCTORAL (PhD) DISSERTATION THESIS

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DILEMMAS OF THE ECONOMIC EVALUATION OF
WATER UTILITY INVESTMENTS – EXPERIENCE IN
HUNGARIAN WASTE WATER TREATMENT PROJECTS
FROM 2007-2013

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1 ANTECEDENTS, GOALS AND OBJECTIVES OF THE RESEARCH

The topic of my dissertation is a complex subject which is especially timely and important even in Hungary. In the planning phase of the new European Union funding cycle (2014-2020) the improvement of water utility is still only partly completed due to the existing environmental problems yet to be resolved. The road to the solution can already be analyzed based on the accumulated experience. The conclusions of my dissertation are not only capable of drawing the lessons of the past, but facilitate the solution of the water treatment problems still present in the Carpathian Basin. Within the topic of environment protection my conclusions concerned the selection process of the projects through the analysis of waste water investments, focusing on the methodology necessary for the selection and the decision-making process regarding the extent of subsidies applied within the European Union. The dissertation did not intend to compare waste water treatment technologies or assess their technical conformity. During the work we came to the financial and economic conclusions solely on the basis of technical and demographic parameters as external data.

1.1 Research antecedents

The origin of the research topic derives from the research on the proper evaluation and pricing of public goods as well as the fair division of public funding and its further productive exploitation. According to the current stage of development of our financial culture, CBA methodology is most widely used for the evaluation of natural goods. A prominent trend among alternative evaluation methods is the methodology of Contingent Valuation (CVM) whose utilization is to be introduced later on in the dissertation.

Financial logic and so-called “hard” evidence justify the application of CBA methodology, however, in several cases the impacts are difficult to map and even more difficult to monetize. CVM can be used as an alternative methodology. Naturally the two methodologies and their findings must not be confused. CBA methodology is recommended to establish the financial returns and the financial gap originating from calculations. Nonetheless, if we wish to find out why the financial gap, namely, the negative present value of the project is worth to be funded from grants, a social impact study should be conducted. In order to quantify social impacts we attempt to carry out a questionnaire based research elaborated in compliance with CVM methodology.

According to certain sources the economic value of a natural resource or a public good is as high as the added value it provides to enhance the well-being of humanity, where humanity is defined by the total of the values obtained from the personal value judgment of separate individuals (Bockstael et al, 2000). Since these resources are at our disposal for a definite period, their proper exploitation is not only a social interest but the pledge of a viable future. As a consequence, only such investments are worth to implement where the expected benefits in well-being exceed the value of the funds or natural resources used (Arrow et al, 1996).

CBA is a transparent and well-defined methodology composed of steps, applied as a support for decision-making since the late 1960s (Pearce et al, 2006). Today it is so widespread that the proper utilization of funds provided to the member states must be justified for the European Union with this methodology. The European Commission has made the use of CBA compulsory in the case of every project over EUR 50 million, while in the case of environmental investments CBA must be applied at all projects over

EUR 25 million, or even below this amount depending on local circumstances (European Commission, 2008).

CBA methodology includes the definition of the frames of the analysis, the specification of the costs and benefits to be monitored, the summary of arising advantages and anticipated costs, the process of monetizing, discounting, the calculation of the cost-benefit rate as well as drawing up the proposals for the decision-makers (Cellini, Klee, 2010).

In the course of CBA, investments are evaluated mainly from a financial point of view, where the cash in- and outflows during the lifetime of the project have to be taken into consideration, followed by defining the present value of these cash in- and outflows with discounted cash-flow method (DCF) (ERDF, 2013).

Beside financial aspects, the investment is also analyzed from an economic point of view, where the calculation of the intended social values gains significance. Naturally, during the observation of social benefits we complement the indirect impacts of the financial analysis. In this part it may be necessary to provide an alternative complementary analysis to the CBA analysis, since in most cases such non-market goods as the definition of the monetary value of externals generated by investments are not available. In cases of observation where the declared preference models cannot or can only slightly be applied, the methodology of contingent valuation model (CVM) is the most widely used option (OECD, 2006).

The generated social values are investigated by the economists on the basis of replaceability aspects mainly, exploring how much the individuals would benefit from the launch of a measure compared to the case of no or only a minimal change (Bockstael et al, 2000).

CVM is a questionnaire-based survey involving the affected population in order to assess the actual amount of money the respondents would be willing to offer for the preservation of the investigated natural resources or for the creation of the expected externals. The aggregation of the value of the WTP amounts obtained enables the assessment and monetization of non-market goods, which thus becomes comparable to the estimation results of social benefits gained with other methodologies during CBA analysis.

The results obtained provide the decision-makers a realistic picture about the assessed investment, based on which they can require the approval, modification or correction of the investment so as to achieve the highest possible social benefit.

1.2 Goals and objectives

During the preparation of my dissertation we drew up the hypotheses to be justified in the course of our research work:

a) Hypothesis 1: It is possible to implement such changes to the elements of the CBA methodology applied during the preparation of the projects operative in Hungary, and/or to the process of the proceedings that would cause significant improvement in the quality of the documentation (feasibility study) serving as the basis of decision-making.

The social benefits of the waste water treatment projects subsidized on the basis of the findings of the observed feasibility studies is higher than its costs. We assume that the methodology selected for measuring social benefits as well as its application are both able to influence the evaluation of the investments.

b) Hypothesis 2: The findings (ENPV) of CVM methodology recommended by the European Union as an alternative methodology confirm the results obtained with the methodology used in Hungary for the assessment of social benefits in European Union projects.

According to our assumptions the scale of residential contributions and the probability of financing from commercial banks can be increased by involving the population and the commercial banks in the project preparation and also by making the project implementation and operation more transparent. The acceptance of the projects as well as the willingness to participate can be enhanced with suitable and continual comprehensive orientation and training.

c) Hypothesis 3: The social benefits of water utility projects, hence the self-financing capacity provided by the consumers can be significantly increased with the intense involvement of the population in the project preparation and implementation phases.

It is the multiple interest of the net payer states of the European Union to introduce the uniform environmental norms in the new member states. As opposed to this, the interest of the new entrants would be to use differentiated environmental norms. On the one hand, it is the common interest of the Commission and the member states that the absorption of the cohesion funds should be realized through easier engagement in large projects, however, this does not necessarily lead either to the proper division of funds or to efficient fund utilization. The net financing member states are economically more developed than the average of the European Union, thus by exploiting their significant research and technological advantage, they also support their own technological export by demanding a standardized uniform solution to environmental problems from the less developed member states. The aim of

the developed countries to protect their own markets and the competitiveness of their own tax-paying companies has also played a major part in the introduction of the uniform environmental regulation system. Within the single European market the sponsor member states cannot afford to incur extra costs from the operation and replacement of their robust infrastructure solely in their own country. A low-cost, yet differentiated infrastructure would provide new entrants with a competitive edge regarding operational and replacement costs. As a consequence, we set up an unconventional hypothesis.

d) *Hypothesis 4: In its current form the introduction of a uniform environmental norm system and the limitation of the technological alternatives for waste water treatment does not support the maximization of social benefits in the long term in spite of all progressive environmental intentions.*

2 THE METHODS APPLIED

The preparation of my dissertation was facilitated by the extensive theoretical specialist literature available. Also over the time it provided a well-established basis for the elaboration of the Hungarian project evaluation methodology. Due to European Union regulations, a relatively in-depth legislative and methodological documentation is obtainable, which continually improved over the five years of our research. We were able to select from a wide range of tools during our research. Firstly, we conducted a comprehensive secondary research, which drew conclusions based on the evaluation of seventy-one feasibility studies. Secondly, we constructed a financial model suitable to assess the impacts of different variables. Thirdly, we carried out primary researches. We conducted expert depth interviews in

order to find explanations to our hypotheses as well as questionnaire based researches in the assigned area, which gave an answer to the social benefits of the ongoing waste water investment. We applied the following methodological tools in the course of our research:

- Our first task was to screen the market failures followed by the review of the specialist literature on the relevant CBA and CVM methodology. We completed the analysis of guidelines, templates and other supporting documentation referring to the Hungarian analysis methodology and the overall project preparation process. The overview of specialist literature predominantly involved investigating the political background of waste water projects as well as their relation to European Union and international standards. The review of professional articles and publications on the economic background and social impacts of waste water treatment also accounted for a major part of the investigations.
- We completed the comprehensive observation of the available feasibility studies, financial and social cost-benefit analyses and evaluation documents. We compared the documentation of seventy-one projects, which enabled us to draw conclusions on the quality of the project preparation and the analysis of financial and social impacts. The analysis was based on the evaluators' opinion invited to assess the project documents. The evaluators worked according to a previously defined evaluation and scoring methodology. We summarized the assessment documents and drew the right conclusions searching for points that allowed for far-reaching proposals.
- To highlight practical issues and analyze the impacts of variables we constructed a financial DCF model. We used this model to gain answers to the financial questions of waste water treatment projects.

- We conducted expert-depth interviews which enabled us to investigate the concerned experts' personal experience and practical problems connected to the methodology. In some cases we used theoretical reasoning based on the rules of logic to elaborate proposals on problem-solving.
- We implemented a representative, questionnaire-based sampling in the sewage agglomeration of Nagyatád, which comprised a large number of questionnaires. To prepare the questionnaire, we conducted expert-depth interviews followed by focus group interviews. We based our research on CVM methodology, while the questionnaire exploring social benefits was adjusted to the present Hungarian social stereotypes and timely focus topics. During the elaboration of the questionnaires and the analysis of the responses, we had to carry out modifications according to well-thought-out assumptions and methodology, in order that the findings of the analysis should be relevant and scientifically based. The analysis of the data was completed in line with a statistic methodology standardized by SPSS.

3 RESULTS

Environmental projects are funded from priorities 1, 2 and 3 of KEOP. The total available KEOP funds for the funding cycle of 2007-2013 amounted to HUF 2,237 billion, out of which the financing of environmental measures reached slightly over HUF 1,600 billion. According to the most recent data, out of 353 project documentations 227 contracts were concluded in the topic of waste water treatment with an awarded grant amount of HUF 455 billion. Up to the completion of the analyses HUF 150.2 billion had actually been disbursed. The average size of the investments calculated with an average reimbursement rate of 85 percent was HUF 2.35 billion.

As of 2007 the calculation method of the project financing gap was changed on the initiation of the Commission. In accordance with the new directives, the projects which support non-companies (state aid) yet generate income have to be evaluated on the basis of cost-benefit analysis (CBA). The amount of the grant is determined with the financing gap calculation definable by CBA. In the first part of the dissertation I conducted a large-scale project analysis in order to define the observation focuses and the goals of the analysis. The subject of the observation comprised the examination of the conclusions drawn from the documentation of seventy-one waste water treatment projects. We were able to identify the weaknesses and challenges of the documentation based on our finding. In line with the completed SWOT analysis we made recommendations for the correction of the applied CBA methodology.

Table 1: SWOT matrix

Strenghts	Weaknesses
Cash Flow planning Financial CBA methodology	Financial sustainability Policy on replacement of assets Practice of variable analysis Risk management
Opportunities	Threats
Definition of discount rates	CBA methodology of social impacts Availability and granting of self-financing Practice of sensitivity analysis

The application of CBA methodology in the course of financial analysis raises several problems. The task of my dissertation was to analyze and synthesize the experience in the application of CBA methodology, give recommendations and fine-tune the methodology. The most common criticism is the excessive capacity building of state-financed projects

(Somlyódy et al, 2011). The risk of oversizing is increased by the fact that the methodology of neither the alternative analysis nor the economic-social impact study means a relevant budget constraint on investments.

3.1 Cash-flow planning

CBA methodology is based on defining the discounted cash-flow. The goal of the analysis is to calculate the key indicators, such as the NPV (FNPV) and the IRR (FRR) indicators by estimating the cash-flow of the project chosen for the selected version.

Cash-flow planning is built on discounted cash-flow methodology. The tried and tested tools of this methodology are used in practice, however, it relies on uncertain assumptions on several details. The analyses revealed two major problems and one opportunity. Primarily, the methodology of fee statement poses difficulties, where certain relevant factors adversely affect the maximization of fee collection. The lower limit of the fees is determined by the minimal income need which ensures the financial and technological sustainability of the investment. This is the only factor to motivate the endeavour for an optimal size of investment. As opposed to this, the objective ceiling is increased by the solvency limit of 3.5 percent projected on family incomes. All of the above is aggravated by the political intentions and election promises of the local governments, which do not allow for an increase of fees. Fee policy has been placed under central supervision. Theoretically, this measure is able to lift local political barriers as long as the fee statement follows a methodology differentiated to match regional circumstances.

Secondly, the issue of stating the correct discount rate arises. The application of the correct discount rate projected such a far-reaching problem that its

analysis extended beyond the dissertation, therefore, we were able to deal with it only superficially. If we take a closer look at the volatility of the country risk, we can observe that the scale has been rather wide in the past years. CDS premium prices have been fluctuating between 1.5 and 7 percent. Sectorial risks have not been stable, either, which can be considered logical as the regulatory and the legislative environment are capable of changing them significantly from day to day. As a result, the invariant financial discount rate of 5 percent is not appropriate in every situation. Additionally some experts claim that for the protection of the future generation the use of a negative social discount rate should not be excluded.

We are going to investigate the opportunity that supports the maximization of the return on investment. The income producing ability of complementary investments applicable in water utility projects has not been explored so far or utilized in practice, either. Their return can be enhanced in two ways, firstly, with the agricultural exploitation of treated waste water sludge, secondly, with energy investments constructed at the sewage treatment plants. The limitations of my dissertation did not enable me to include a detailed analysis of this topic, either.

3.2 Variant analysis

Variant analysis serves as a basis for justifying the application of the selected technology. During variant analysis the following dilemmas arise:

1. The filtering of possible variants is subjective. Is it feasible to conduct a variant analysis based on objective criteria? Does a well-defined pilot project (benchmark) exist?
2. In case the decision variant refers to one component, it is difficult to describe and analyze its relation to the rest of the components. Are the

different technologically relevant variants introduced adequately and comprehensively?

3. It is challenging to provide statistic estimates on demographic and consumption processes thirty years ahead. The presentation of the envisaged goals is subjective, also, in most cases the demographic base data is not consistent. Is it possible to set the social optimum properly?

During the preparation of variant analysis we should endeavour to examine the internationally certified variants that conform to the Hungarian natural environment, geographic and other environmental factors. When presenting the variants a filter, that is, the aspects of family income based solvency have to be significantly taken into account. Owing to the financial and technological sustainability, the lower income the population is, the smaller sized investment burden it can bear. It would be advisable to require differentiated environmental norms for agglomerations with a low solvency level or a decreasing population. Also, the range of applicable technological options should be extended in order to facilitate compliance to the norms.

We should not forget that variant analysis could be made easier by finding such investment and operational reference points that are able to assign efficiency minimums. It is advisable to determine the benchmarks as specific indicators.

3.3 Sensitivity analysis and risk management

The major criticism of sensitivity analysis is that the analysis regarding performance indicators does not consistently point out the key variables as the ones to be dealt with, which actually influence investment and operational risks.

The applied methodology of risk analysis complies with international standards. Risk management strategies are prepared for the revealed risks. The study is supposed to define the variables based on a two-dimension impact probability matrix. Unfortunately in this case several critical variables are not examined, therefore, no sensitivity analysis is conducted regarding either the volume of water or the amount of the collected waste water fees. The volume of water is regarded as a critical factor from several aspects as it considerably impacts the cash-flow as well as the technical efficiency of the investment. According to the findings of the primary questionnaire-based survey conducted later on, we can prove that the probability of waste water fee payments increases as the population is supplied with an increasing amount of information. The involvement of the population is indispensable to participate and improve the self-financing capacity of the projects.

3.4 Economic-social cost-benefit analysis

Economic or social cost-benefit analysis is a significant keystone in determining whether it is worth to launch the given project. The financial gap revealed in the financial analysis, the social impacts and budget adjustments have to be considered when deciding if the project can be financed from public funds. The most cardinal part of the economic analysis is the identification and quantifying of externals, however, budget (tax and contribution) adjustments and the shift from market price to standard cost price (for instance if labour costs do not express the real picture, the use of shadow prices is recommended) need to be examined, too.

The most important yet weakest link of CBA methodology is the economic or social cost-benefit analysis.

3.4.1 Alternative estimation of social benefits

In order to quantify social benefits, the analysis based on CBA methodology complying with Hungarian and European Union standards, compares the avoided investment burden (the construction of individual sewers) with the costs of a central sewage treatment plant and canalization. In the case of the seventy-one projects involved in my analysis, the methodology consistently stated a positive social benefit (ENPV), thus the investments can be funded according to the European Union methodology.

As a goal of our research we intended to carry out the social impact assessment determined by CVM methodology. In order for a successful experiment, we needed representative samples, carefully elaborated questionnaires and proper, well-prepared implementation. We based the analysis of the data on the statistic methodology defined by SPSS.

The antecedent of the research was the successful investment application of the Nagyatád Regional Sewage Association for the development of the canalization of Nagyatád and region and the sewage treatment plant of Nagyatád. The total net costs of the selected variant amounted to HUF 4,984,853,000. Pursuant to the administered data utilized by RMT, the project was eligible for European Union funding as the financial net actuarial present value was negative in the absence of funding, ($FNPV/C = \text{HUF} - 3,594.7$ million, $FRR/C = -2.51$ percent), while the economic return indicators of the project are positive ($ENPV = \text{HUF} 1,521.3$ million, $ERR = 8.47$ percent). The financing gap of the project was 84 percent (RMT). The remaining 16 percent of capital was funded from the one-off payment for the connection to the canalization by households directly involved and by the local governments of the concerned settlements.

The main objective of the research observation is to examine the value of the expected social benefits also with another methodology so as to complement and verify the generally accepted CBA calculation methodology. We assessed the monetary values of the expected social impact of externals assigned with the help of expert depth interviews, based on the subjective value judgement of the population. We compared the obtained value with the costs arising during the investment. The data acquired in the course of representative sampling was suitable to verify the values applied in the previously assumed RMT (for instance we explored the annual costs of sludge collection). Nonetheless, the main objective of the research resulted in the comparison of the values of the expected social impacts during investment.

Table 2: Definition of the total WTP and WTA of externals arising in the course of waste water investment

	WTP			WTA
	Bottom of the range	Middle of the range	Top of the range	Average
Increase in property prices	642 436 515	970 651 752	1 414 440 039	351 398 / capita
Job creation	233 760 334	388 509 642	577 373 620	
Improvement of tourism	158 950 667	267 816 106	376 689 801	
Convenience aspects	280 521 855	418 951 362	557 390 624	
Environment protection	226 451 638	370 105 168	513 769 301	
Total WTP	1 542121009	2 416 034 029	3 439 663 384	5 719 353 848

It is clearly visible that the population participating in the survey regarded the social benefits of the investment (WTP) as lower than the scale of the social

benefit presented in the RMT (HUF 5,662 million) even at the top of the range. The higher value resulting from the aggregation of the average WTA amounts per capita is supported by specialist literature. We can see that in the case of the survey in Nagyatád the WTA amount is almost identical with the findings of the CBA methodology.

At first glance it might be surprising that the obtained WTP values show such a significant discrepancy compared to the WTA amounts, however, this precisely support the research findings stated among others by List and Gallet in 2011, also by Little & Berrens in 2004 that the size of the willingness to pay and the expected compensation for the lack of the economic or social benefit may differ by 135-300 percent.

4 CONCLUSIONS AND RECOMMENDATIONS

The aim of the dissertation is to pinpoint whether the current Hungarian and European Union procedures comply with the international standards whose fulfilment is indispensable for the involvement of external sources. We intended to provide proposals for the fine-tuning of the methodological areas of CBA analysis which match the viewpoint of investors and sponsors, too. Our research findings clearly proved that the fine-tuning and correction of the project methodology facilitates the improvement of the project quality as well as the successful implementation of the project. My dissertation provides a detailed analysis of the proposals for the correction of the elements of CBA methodology.

Not only do the more in-depth and more comprehensive analyses of the economic-social impacts provide new data and aspects for the comparison of projects, but also exert crucial influence over the allocation of tight financial

resources. The startling experience of the analyses conducted in practice is that the decision-makers and consumers involved in the preliminary interviews were more affected by the opportunity to express their opinion than we expected. We were able to create strong commitment only by asking their opinion on the realization of a public service. The most efficient tool for increasing social benefits and the level of acceptance is the involvement of those concerned. As a result, we can conclude that the steps in the application of CBA methodology should be modified. First and foremost, we recommend altering the social impact assessment according to the methodology introduced in the dissertation. The assessments based on the new methodology can be financed from European Union funds. Based on the assessment we advise to determine an investment interval defining the size of the investment sustainable in the given agglomeration. Second, we propose the optimization of the technical alternative analysis. For this we have to be open for alternative individual solutions, and analyze the types of technologies to be used in order to comply with environmental norms. Apart from the investigation of geographic circumstances (soil texture, inclination) and the setting of intended emission values (soil pollution, water quality), population density and the expected demographic, income and consumption trends have to be properly estimated. The uniform and complete production of input data and the establishment of estimates and trends require centrally coordinated expert work. Besides, the approval of the Commission is necessary to extend the use of applicable technical and technological solutions and to apply differentiated environmental norms. It is indispensable to provide professional guidelines and support for the project owners in order to explore technical alternatives. The financing of the described processes has to be raised not only at an institutional but at a project level, too. Institutional financing can be obtained through the Technical Assistance

Programme of European Union funds. However, several factors are necessary to raise project-based financing. First, the long-term financing model of the executing local government project owners has to be ensured at a legislative level. Second, commercial banks providing complementary financing have to be involved and motivated to participate in the financing process. The tasks are well-defined, yet their solution is not simple.

5 NEW AND NOVEL SCIENTIFIC RESULTS

While writing my dissertation and conducting research we carried out the in-depth analysis of two topics among the several questions to observe. Firstly, in connection with the methodology of CBA researches we explored which elements need to be further improved. We investigated several methodological factors and made proposals for modifications. We identified the chapter on social impact assessment of the CBA analysis as the most critical point. Based on the above, we thoroughly examined the social impact of investment as a second focus point.

Result 1: During our research we compared the methodology applied in Hungary with the internationally used standards. We came to the conclusion that the applied analyses were essentially created in compliance with international standards, and the ones concerned use them in practice accordingly. Naturally, following the examination of the theoretical background of the methodology, it is essential to consider practical experience to be able to make recommendations on fine-tuning and modifications. In order to make recommendations it was necessary to conduct the comprehensive quality analysis of the projects prepared in Hungary.

The research covered over five years between 2008 and 2013. We revealed that the analyses had become transparent and comparable owing to the simplification of the implementation process of CBA analyses and the central funding for the utilization of the methodology. **All in all, the corrections carried out in the CBA analyses were capable of triggering quality improvement in the prepared documentation, which justified our first hypothesis.** Our statement is supported by the observed documentation, where significantly higher scores were awarded by the evaluators after the modification of the CBA procedure.

Result 2: The obligation to fulfil the commitment of waste water treatment in accordance with Directive 91/271/EEC can be regarded as a given circumstance. Nonetheless, beside the liability for implementation we must be aware whether the benefit of the investment for the society exceeds its costs. In Hungary no social impact assessment on waste water investments with representative questionnaire-based research has been conducted. The findings of the chapter of the social impacts of CBA applied for investment decisions confirm that socially useful investments can be made as the social cost-benefit analyses of the CBA analyses (based on the methodology accepted by the European Union) consistently indicated the ENPV values of the projects to be positive. The analyses, however, relied on a very important and determinant assumption. The applied condition is that in each assigned waste water agglomeration waste water treatment must be solved in accordance with the European Union environmental and waste water treatment norms during the derogation period. The following technological solutions can be applied: individual reservoirs or gravitational canalization and central treatment plants.

Our analysis did not focus on how useful the society considers the solution of the given environmental problem. We can observe that the existence of a positive ENPV was only partly confirmed by the control research of the representative questionnaire-based research on social benefits. It did not reach the direct costs of the project even with an interval aggregation based on the softest conditions by adding up the WTP values. We managed to identify a benefits value higher than the direct costs only in the case of the WTA value. **As a consequence, we did not succeed in confirming the second hypothesis, yet our findings do not completely verify its rejection, either.** The implementation of the proposals of our dissertation will provide an opportunity to apply the methodology on samples with a considerable number of elements. In the case of samples with a low number of elements, it is possible to draw final conclusions only if we convert each every analysis and are aware of their findings

The hypothesis not being confirmed by the research findings can be attributed to two reasons, which probably exert their influence simultaneously. First, the awareness of the local population and the environmental integration of the project do not reach the level where the users would consider the benefits of the project higher than its costs in every case. This situation could be improved by involving the consumers in the projects more deeply, organizing trainings and using widespread “involving” communication. The identification and perception of social benefits by the consumers play a significant role in making the projects financially sustainable. The analysis pinpointed that the more conscious the consumer, the more they perceive the social benefits of the project.

The other negative impact of the project can be a budget higher than justified. This factor can only be reduced with the in-depth investigation of regional

differences and technical alternatives. The professional limitations of the dissertation only led to the revelation of this problem, however, the elaboration of alternative technical solutions suitable for the regional circumstances would be necessary for the proposal of solutions. Although the cost efficiency of the applied solutions was analyzed by the project evaluators, as they did not possess any comprehensive benchmarks, the assessment of the cost efficiency is uncertain.

Result 3: In the course of the questionnaire-based survey in the sewage agglomeration of Nagyatád we carried out such a high-element-number and representative analysis whose findings enabled us to draw obvious conclusions. Based on the analyses, the consumers living in the settlement and the people who accepted the fee of connecting to the canalization consider the social benefits of the project higher. Mostly these citizens were addressed and involved in the project preparation by the investing local governments. Several experts regard the proper communication of the project as pointless administrative costs. **We can state that the third hypothesis can be confirmed as in case the population is well-informed and the consumers are aware of the impacts of the project, they reward this with higher WTP and WTA values.** Although the WTP and WTA values indicate the appearance of only one intention, the acceptance of the final consumer fees will probably be higher among identical income conditions, too. Proper communication entails transparency, which reduces risks, hence, commercial banks providing finance are more willing to lend. In case the bank understands the goals, cash flows and risks of the project, it is able to decide on the financing more quickly. By raising self and external financing ability we can avoid such a situation which Hungary faced at the end of the funding cycle of 2007-2013. The implementation of several projects halted

due to the lack of financing caused by the fact that the projects were not financially sustainable and the financial risks lacked transparency.

Result 4: Between 2004 and 2013 a funding of HUF 8,000 billion had to be spent efficiently in Hungary in a way that the impacts of the measures should exceed their costs. As a comparison, we will have spent almost HUF 1,000 billion on waste water treatment during a longer period, that is, between 2000 and 2015.

Based on the examination of the CBA analyses prepared between 2010 and 2011 and the review of the applied methodology, we can state that it served the interest of neither Hungary nor the European Union that the project owners should conduct in-depth analyses on the social impacts of waste water treatment. It was the interest of both parties that a significant part of the cohesion funds should support the construction of an expensive infrastructure that complies with high standards.

Let us take a look at the interests of the two parties involved. The European Union as the sponsor wishes to create a playing field where the competitiveness of the companies of central countries (Northern and Western Europe) should not suffer. Taking advantage of their technological and capital advantage, the developed member states will become suppliers in the large infrastructural projects of the periphery countries (Southern and Eastern Europe). This has a direct positive effect on the economy owing to the demand-based market creation. Its indirect effect is that their higher standard hence more expensive infrastructure results in higher public utility fees. Higher operational costs do not stimulate the companies to deploy their

production to developing European countries based on financial considerations.

In the course of the Operational Programme level talks on funding Hungary was concerned about not being able to spend HUF 8,000 billion on projects that fulfil European Union requirements. Several experts warned about potential absorption problems at the beginning of the cycle. With the acceptance of uniform environmental norms, the solution of not applying a differentiated approach as well as tying the major part of the funding in large-scale projects seemed convenient and easy to handle. The large-scale projects were supported by the project owner local governments and the companies interested in the implementation. At the beginning of the cycle only few experts anticipated that the implementation period of n+2 years authorized for large-scale projects as well as the increasingly stricter European Union funding and public procurement regulations will create an objective barrier which will make the spending of the total EU funds not only difficult but almost impossible. The relatively poorly regulated and controlled social impact assessment confirms that the social impacts of the decision are not important for the decision-makers of either the European Union or Hungary. **The fourth hypothesis is supported by the findings of the examination of Nagyatád. Based on the analysis the risk that the social benefits of the obligatory compliance to the uniform norm system do not exceed its costs is significant.**

6 PUBLICATIONS RELATED TO THE DISSERTATION

6.1 Full-length English language publications related to the dissertation

Boros Áron, (2011), Cost benefit analysis of waste water projects – learning from experience, Financial and economical problems in the first decade of the 21th century/Katalin Gáspár-Vér, Cluj-Napoca: Scientia / ISBN 978-973-1970-60-8, p.133-141.

Boros Áron, (2011), Financial evaluation of feasibility studies of waste-water treatment projects, Regional and business studies, vol. 3 suppl. 1, p. 385-393.

6.2 Full-length Hungarian language publications related to the dissertation

Boros Áron, (2009), Környezetvédelmi beruházások értékelése - EU irányelvek, II. Kaposvári Gazdaságtudományi Konferencia, conference volume 2-3 April 2009.

Boros Áron, (2010), Szennyvízkezelési projektek finanszírozására ható tényezők, Hitelintézeti Szemle: year IX. vol. 4, p. 381-394.

6.3 Full-length Hungarian publications not related to the dissertation

Bánfi Tamás, Boros Áron , Lovas Anita, (2011), Vállalati vezetők innovációs érzékenysége, szemlélete és szándékaik (egy felmérés tapasztalatai), Vezetéstudomány: year XLIII. vol. 3, 2012 / ISSN 0133-0179, 0133-0179.