

**THESES OF DOCTORAL (PHD) DISSERTATION**

**REGIONAL APPROACH TO THE DEVELOPMENT OF  
PUBLIC WATER SERVICE IN THE AREA OF DEBRECEN**

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## **1. Antecedents and objectives of the research**

The adequate environmental conditions are essential to ensure welfare and healthy life to present and future generation. Our task is to preserve the current status of our environment by accomplishing the social – economic tasks. Beside reducing the human impacts, we must adapt to the here and now inevitable process with adaptation to the changes (*Láng, 2003; Láng – Jolánkai – Csete, 2007; NDA, 2007; Rosta, 2008; Baranyi – Fodor, ed. 2012*).

At the same time, the author of this thesis considers the above attitude insufficient, which is otherwise rational and generally accepted. While at the persons of economic life the profit has priority, the politicians - who have most often a constricted approach and scope because of the election periods – have failed to impose effective, transboundary global frameworks so far, and have not been able to give effective answers to the changes. Beside the fundamentals and the changes which are inevitable, the science has to solve the problems of environment remaining in its own scope, and simultaneously it has to specify the method of warning and adaptation.

The water, as a strategic resource, is manifold as for its role, it is decisive in connection with safe and healthy drinking water, wastewater collection, - treatment and disposal, as well as in relation to mineral, medicinal and bathing services in the point of quality of life and it is determinative as for the meeting the organic water demands in connection with the conservation and biodiversity. It has also significant role in the scope of agricultural use, forestry, fish farming, it is condition of the operation of the industrial, vehicular and service sectors, its environmental safety relations are remarkable, and as a renewable energy source it is not a negligible potential source. Accordingly, the water – in any potentially utilizable form – has to be protected especially and has to be used logically and this way its local, regional, national, EU and global aspects are decisive.

The effect of the global climate change is the lack of humidity due to the aridity, together with subsidence in underground water level because of the decrease of water supply and beside these things other unfavourable natural processes may occur. The natural water supplies and deterioration of water quality have a detrimental effect on the ecosystems; it can particularly endanger the subsistence, the biodiversity of the aquatic, wetland habitat. Regarding the water quality, the self purification of water can decrease. The extremities as a

manifestation of high intensity rainfall will increase the load of sewage and drainage systems and these can lead to overflow, contamination while because of the impacts of the predicted climate changes, incremental flood and internal waters can be expected. Among other things, the *Catch Basin Management Plan*, relating to catch basin of Danube River, intends to handle these processes too. The quantity and quality problems are equally make it hard to achieve and maintain the „good status” which is specified by *EU Water Framework Directive*. (Lászlóffy, 1982, Liebe, 2002, Margat, 2007, VKKI, 2010). On behalf of protecting and maintaining of the quality and quantity of drinking water, the reduction of underground water supplies are needed by all means. The reduction of industrial and other private water use is crucial; furthermore, the efficiency of the drainage cleaning should be amended. (Tóth, 1999, Custodio, 2002).

Related to the area of expertise, the significant function of different economic means is to achieve a more maintainable and more reliable water management, water policy with cost effective solutions and beside this, a more efficient allocation of water supplies is necessary (FEEM, 2012).

The *National Water Strategy* is intended to substantiate the policy of water conservancy, the development of irrigation and drought in the coming period, in terms of sustainable water management. The fundamental aim of the national water strategy is to create a water management which utilizes the supplies optimally, that is to create the balance between the needs of society and the water as an environmental value. The sustainability is considered to be the aim of the optimization. „It is stated among the constitutional objections that the water supply is the common heritage of the nation, the state and everyone’s responsibility to protect, maintain and preserve it for the future generations. Consequently, the water is national assets; proper management of water resources is required by its quantity and quality preservation. Guarantee of efficiency is if the state is the owner and operational manager of water resources.” (*National Water Strategy consultation topic of debate*, 2013)

In accordance with the preceding facts in Hungary, to study the status and opportunities of water management in a complex way, to protect the quality and quantity of drinking water, to reduce the use of underground water supplies, respectively to improve the efficiency of water purification has become an emphasised priority national, regional and local strategic task. For today, the validation of the principle of sustainability came to the front in our country beside

the safety of the drinking water supplies. One of the aims of the *3rd National Environmental Program* is to develop the fragmented management structure, and to increase the associated competency and service safety. Government action is needed to explore the environmental and cost-effective solutions and to encourage their use. The number of water public utility companies is one of the indexes which show the realization of the related program. *Act CCIX of 2011 on water public utility supply* regulates the realization of the water public utility services, which gives priority to the implementation of the regional water public utility systems, the importance of cooperation of the water public utilities, together with the avoidance of the cross financing.

In these days, two contradictory processes can be observed as for the operating form of the water services. We have seen a kind of privatization wave in the utilities sector in the past years, which was significantly amplified by the fact that the EU, the European Central Bank, the International Monetary Fund, respectively in the case of non-EU countries the European Bank for Reconstruction and Development, EBRD and the IFC, the supporting department of the World Bank stipulate the privatization of the corporation of other state sectors and the privatization of the water services. At the same time, support can be observed for the major state operator role in these days, as a result of the experiences of the recent decades, which shows that little money was invested in by private-owned companies, if so, they needed significant profit guarantees, respectively, they provided their services at high costs.

Due to the water supply's monopolistic nature of the market, on the one hand, suppliers cannot compete with each other to attract more buyers, on the other hand, it is often seen that companies avoid competing with each other. These conditions, and the inadequate central control contributed to the fact that hard profit orientated water public utility providers could come into existence beside the low willingness to invest and service provided at a high price, and additionally these suppliers at the most followed only the relevant regulations as for the environmental protection and sustainability. Therefore, the popularity of these suppliers has fallen considerably (*PSIRU, 2012*).

The primary goal of the research is, by examining the water policy programs and projects and the pertinent legislation, to observe the ecological status of our water resources, to analyze the local and national water consumption customs, the current situation in Debrecen, and the experiences as for the foreign, regionalized

water policy. Additionally, to study the possibility whether the national and local regionalized water policy can be realised taking into consideration the ecological and economic relations, as well as to evaluate the institutional conditions of the integrated water management. Another aim of the research is to evaluate whether private, state or government owned water public utility companies can serve better the short and long term interests of the community. In this context, we examine whether there is a common denominator between the market oriented water exploitation and the enforceability of the sustainable water base protection.

Closely related to the formers, the most important, as it were the most decisive peculiarity of our work is to model the public water service operation through the example of Debrecen and its closer region, which is a regional centre in Plain from the point of view of water public utility's condition systems. On the other hand, we intend to determine such a possible economic operational form, which can be adapted on the basis of the foreign experiences and at the same time to take into consideration the ecological, water quality and other sustainability aspects. We wish to prove by examining the regional dimension of the water public utility service that as for the environmental and economic sustenance, it is profitable to compact the currently 210 pcs (*Ministry of National Development, 2013*) mostly the municipal water public utility companies into a more viable and sustainable integrated system. Companies under the analysis which are beyond Debrecen agglomeration and in Hajdú-Bihar county nearly two dozens.

This thesis is about to analyse the environmental impact of the water production and its economic aspects, as well as to examine foreign – mainly Dutch – examples. We have formulated our conclusions and suggestions on the score of good exercises and experiences in order to contribute to form and to develop an effective water public utility service. We would do this in Debrecen and its region so that a sustainable and an optimum size residential water service system can come into exist. The following hypotheses are the subject of the analysis, which are in accordance with the scientific objectives, searching answers for the global, regional and local challenges:

H.1. The community owned water public utility companies serve the sustainable protection of the natural resources and the interest of the country's population better than the companies which are privately operated strictly on market base.

H.2. The regional organization of water public utility service is more preferable than the decentralized, fragmented service structure.

H.3. The Debrecen Waterworks Ltd. is able to meet the challenges of the role of the region centre.

We have examined our hypothesis through a complex approach of the water management issues, taking into consideration and evaluating the quality and quantity of surface and underground water resources in Debrecen and its region. On the other hand we took into consideration the preceding, the current and the long term concepts of the water recycling and water base protection, and in the view of the National Water Strategy.

## **2. Methods of the research**

### ***The subject of analysis: water supply of Debrecen and its region.***

The first written document of Debrecen's drilled wells, written by Imre Csécsi, can be read in the Weekly paper of Industry Association in 1845, published in Pest: „Starts drilling in the market 20th August 1840, goes down, even never beat the wooden tubes, but only presses, to 32 fathoms, where he found plenty of water ... estimated the amount of it from that it gave 800 „icce” at every quarter at trial pulling, and since then it has not reduced. Normal position of it is two fathoms one foot below.” (Marton quoted, 2002). According to the description, in a 60 meter-deep well, it means -4,2 m static water level, the yield of it was approximately 45 liter/minute.

Nowadays, the tap water and drinking water are the same concepts in Hungary. The production of this high quality standard food, like a product has been made continuously since 1940 in Debrecen from 96 pieces groundwater wells and since 1976 from purified water of surface water base (Eastern Main Canal) and the permitted capacity is 55 000 m<sup>3</sup> per day.

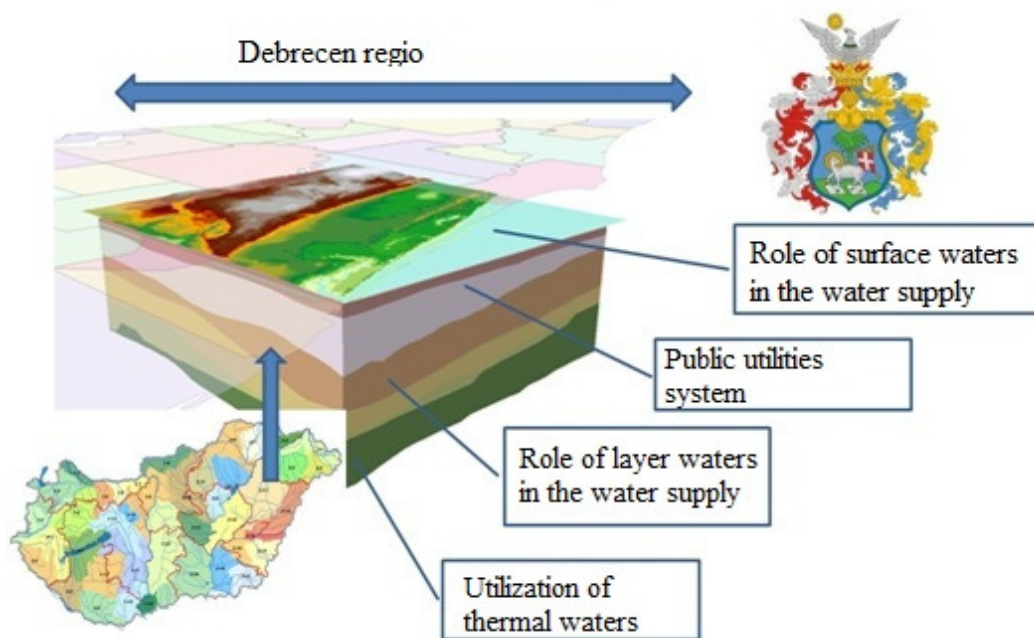
The development of the drinking water supply in the studies area changed in direct proportion with the increase in the population, as well as with the intensification of industrial activity. The water public utility production peaked in 1970s and 80s, reaching the value of 20 million m<sup>3</sup>/year. After this, it declined steadily, and in 1998 it was 13 million m<sup>3</sup>/year. According to the datas in the Debrecen City Environment Program, the 20% of the 2009 water supply came from the Eastern Main Canal, which was delivered in transmission line.

The Debrecen Waterworks Ltd. takes part in the waterbase protection program too, of which aim is to protect the water supply layers from the surface pollutions. According to a study carried out in 1996, three of the depth water bases (85-200m), which determine the water supply of the city, were declared to be vulnerable. In Debrecen and its surroundings, five of the nearly 720 water bases got into the protective aim program of the water bases. In 1998 the process of securing these bases started, in which the diagnostic phase was completed in 2001 and the calculations for the hydrogeological protection pipe and protection area were prepared. (*Debrecen City Environmental Program, 2009–2014*).

The space and time frames of the research are specific between wide ranges, because the public water supply is a part of a rather complex system due to its water exploitation nature, and technological and organizational structure (*Figure 1*).

Fig.1.

*The space and time frames of the research*



Source: Edited by Tamás, J. and Nagy, S.

To operate the water public utility cost effectively, the Northern Great Plain Region Development Agency developed the feasibility pre-study of the Northern Plain water quality improving program which was concerned for the contraction of water supply. The project aimed to handle the water supply problems in one package at administrative regions (*NOGPRDA, 2006; Ányos, 2011*).

In Hajdú-Bihar county more than 20 companies are registered which operate as water public utility service companies. As for the quality policy of the Debrecen Waterworks Ltd., it is not negligible that they are in full compliance with the existing legislation; they introduce the new processes continuously, which greatly contribute to reduce the costs and the environmental pollution. The Debrecen Waterworks Ltd has extensive operational experience since the innovative management expanded its water supply activity to Bátorliget, Biharkersztes, Nádudvar, Nyírgelse, Nyírlugos, Nyírmihálydi, Ömböly and Terem settlements; it also has the operator rights in Székelyudvarhely and Nagyszalonta.

### *Analysis criteria of the concepts of the National Water Strategy*

In terms of the research, the National Water Strategy is a determinative document, which was prepared by the Deputy State Secretariat Responsible for Water Issues, State Secretariat for Environmental Affairs, Ministry of Rural Development. This document is about the water management, irrigation and drought management and was published in March 2013. Its aim is to establish the future policy of the water management, irrigation development and drought management.

The short-, average- and long term activities were drawn up in the National Water Strategy which is available for social coordination. From these activities, the regional drinking water supply and the related surface and groundwater protection under the analysis were evaluated in Debrecen and in its region.

From the goals required to validate in *short terms*, we examine the issue of the site-specific water quality improvement. According to the Act CCIX of 2011 on water public utility supply, we evaluate the potential role of the Debrecen Waterworks Ltd. in the integration processes, based on foreign examples, including details the official price determination and practise of control system. With regard to the medium term goals, we examine how the integration and regionalization can serve the preservation of the value of the water public utilities, respectively, economic management with the water supplies. In the long term goals determined by the National Water Strategy, we examine that under what conditions the water public utility systems can be operated effectively due to the increased role of the state at tolerable price, respectively, we examine what are the critical points in Debrecen and in its region as for the securing of the exploitable drinking water resources and the conditions of the long term preservation would be provided.

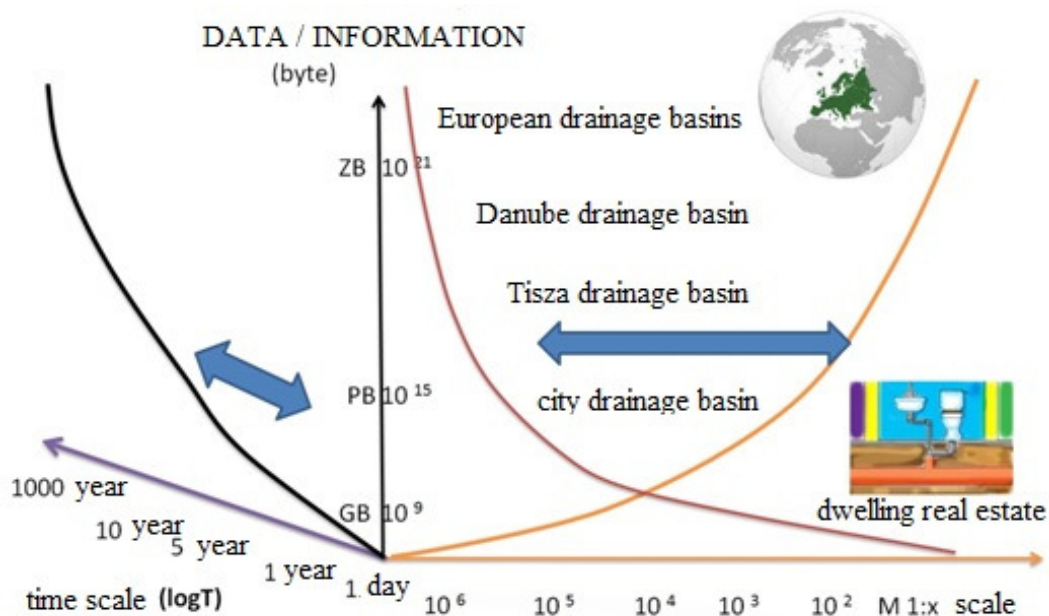
## Applied research methods

To accomplish the research goals, complex combination of primary (empirical) and secondary (academic, mainly literature) research methods and procedures are needed to use interdependently and complementarily. Consequently, the theme from the beginning presupposes the inter-(multi) disciplinary nature of the research procedure, complex interpretation of the different scientific disciplines and part disciplines – in part, because the theme affects social science and economic relations, on the other hand, it affects natural science (ecological, geological, hydrogeological, water quality, etc.) questions.

Firstly, the use of secondary process, foremost processing of the wide and rich global and regional and local literature was well-founded. As regards the extensive literature, twofold methodology was required during the process. On the one hand, the research would reach from the global dimensions to the regional and sometimes local contexts during the interpretation of the rich sources of literature focusing on the essence. On the other hand, it would be capable of achieving the theoretical foundation of the empirical studies (*Figure 2*).

Figure 2

### *Spatial and temporal scale of data and information*



Source: Edited by Tamás, J. and Nagy, S.

A for the primary research, statistical data sources are widely available, especially the yearbook and thematic processing of the Hungarian Central Statistical Office, as well as the local data bases, planning documents, various other reports, publications and studies of the Northern Plains Region, Debrecen city and its surrounding area and the Debrecen Waterworks Ltd., furthermore, the available regular statements, business development concepts, respectively, other data concerning the production and the management.

Beyond the listed things, direct technical information became available for the author of the dissertation, as an ordinary member of the Hungarian Hydrological Society, by direct involvement, as well as fast access to actual publications was provided in the theme of hydrology appeared in various conferences held at home and abroad.

The personal data collections to the research also belong to the empirical methods toolbar, beside the process of the domestic and foreign literature. The research methodology also includes personal interviews, evaluation of case studies, as well as prominence studies among managers, plant managers and leaders of the Mayor's Office of Debrecen.

### **3. The main findings of the thesis**

#### ***Application of the Water Framework Directive on the water base of Debrecen***

Hajdú-Bihar county belongs to the Hortobágy – Berettyó (2.15) and Berettyó planning subordinate unit (2.17). The River Basin Management Plan is marked out for improving the quality and quantity of water by restraining the unauthorized use of water, defining the requisition limit, as well as applying the water saving and water saving farming technologies. The River Basin Management Plan appoints for Debrecen Waterworks Ltd. that water resources of No I. water production plant is vulnerable, the amount to be protected is 15 000 m<sup>3</sup>/day, the amount to be protected in the No II. water production plant is 25 000 m<sup>3</sup>/day. The water resource of the No IV. water production plant is not vulnerable, the daily amount of water to be protected is 15 000 m<sup>3</sup>/day.

Based on an extensive study of Debrecen and its region can be confirmed that the „good status” allocated in Water Framework Directive as an environmental objective can be available by 2017 theoretically, but significant financial cover and

time factor are needed to implement the necessary actions, which is not a negligible hindering factor in Hungary beside today's economic conditions and prospects.

In relation to Debrecen, concerning the protection of groundwater, however, the contamination remains a significant and not solved factor, which was identified in the field of previously Hajdúsági Pharmaceuticals, later Biogal Pharmaceuticals, and today TEVA Pharmaceuticals Ltd. and according to data of archives; it is 50-60 years old. For example, *Handari* (2010) deals with the effects of the contamination on the water base, as well as the aspects of redemption in details.

The relevant part of the River Basin Management Plan to the Hortobágy – Berettyó subordinate unit contains the problem as follows: contaminated water with halogen and hydrocarbons was found in the field of Debrecen Waterworks Ltd in 2002. 37 operating water bases and 6 long term water bases can be found in the area of Hortobágy – Berettyó subordinate unit and from these there is 1 where on the score of contamination of the monitoring wells, a level of pollution may arise without provisions which involves the restraint of the water base so as far as possible the polluting resource has to be dissolved and the detriment has to be relieved (VKKI, 2010).

The desired target was reached as for the large, complex pollution in Debrecen city and in the city's water base – with the exception of the above mentioned pollution – , the residual pollution no longer means a significant risk beside the detailed monitoring provided by the control.

### ***The impacts of the groundwater exploitation in Debrecen***

It is necessary by all means to protect the quantity and quality of drinking water, respectively on behalf of its maintaining to reduce the use of the groundwater supplies.

For today, applying the principle of sustainability increasingly came to the front in our country beside the safety of drinking water, since; the majority of the Hungarian waterworks produce so much groundwater which exceeds the new supplies, like other European practise. The overuse involves complex negative consequences, such as increased operating costs associated with the sustained water yield or might lead to a decline in water quality due to potential changes. In addition, the impact on the groundwater level is not negligible, and through of it

the impact on ecosystems over the surface either (*Marton*, 2002, 2009, 2010a, 2010b).

*Marton and Szanyi* (200) showed on the basis of a long time series study in connection with the percolation between soil layers, that surface movements can be measured in the field of I. and II. water production facilities of Debrecen. Thus the former assumption was confirmed that the depression crater can be observed and this has an effect on the level of the groundwater.

As a result of the exploitation of industrial and drinking water, relative relief reduction was evinced according to the measured data in the period 1927-1966 (*Orlóczi*, 1968), meanwhile after the peak production in 1986-88s, especially from the mid 1990s the layer water production of the water public utility has continuously been reduced in Debrecen. We can say that it has been reduced from 25 million m<sup>3</sup> to 16 million m<sup>3</sup> per year and the industrial water exploitation has decreased in a similar extent.

It may be noted that I. National Environmental Program involved the layer water exploitation potentially associated with relief prolapse, as a problem, which is necessary to be managed. Furthermore, II. National Environmental Program envisaged the termination of the decrease of the underground water pressure. The project of the National Water Strategy did not draw up a necessary intervention point as a relevant target task.

As regards the water quality indicators, in the drinking water supply system in Debrecen, there was no significant change as for the amount of chemical elements and compounds dissolved in water between 1982 and 2010. The Debrecen Waterworks Ltd, fulfills the obligations under the *98/83/EC Drinking Water Directive*, in respect for the five emphasized parameters (boron, fluoride, nitrite, arsenic, ammonium). Thus, investment is not required in the *Water Framework Directive*, respectively in the *National Water Strategy* so that they could improve the quality of drinking water.

### ***The implementation of ISPA program in region of Debrecen***

The liquidation of communal solid and liquid contamination sources was effective as for the protection of our surface and underground water resources. Respectively, the treatment of waste and sewage in a reserved manner was also effective, which

was implemented as a part of a successful ISPA project in Debrecen and in its region. (*Ministry of Rural Development, 2003*).

Under the program, three regional waste handling plants were evolved in Berettyóújfalu, Debrecen, and Hajdúböszörmény in their area. Part of the project was that the selective waste collection system was evolved in 66 settlements of the county, furthermore, landfills with not suitable technical specifications were closed and recultivated, which previously polluted the environment uncontrolled. Debrecen and its neighboring settlements, Hajdúsámson, Ebes, Sáránd and Mikepércs submitted a common regional competition to the ISPA in 2001 on behalf of improving the sewage drainage and purification. The program related to implement waste water drainage primary care of 75 000 people, waste water drainage supply standard of 120 000 people, waste water purification system of 220 000 people. The population of the above mentioned 5 settlements is nearly 250 000. In addition, the combined channel system in Debrecen was disconnected which was used for leading the rainfall water away. Thus, it can be prevented that the waste water could get into the surface stream without cleaning, through the rain effluents at the time of rainfall. To increase the efficiency of waste water purification and to minimize the environmental impact fee, modernization of biological purification technology and sludge dewatering was implemented.

Overall, by the realization of the ISPA program, sewage of Debrecen and its area has risen from 60% to 95%, which can be considered clearly successful in connection with the objectives of Water Framework Directive and National Water Strategy (*Debrecen City Development Programme, 2007–2013*). These significant volumes of investments contributed to the cleanliness and environment of the area. The „*ecological footprint*” of the area is not satisfactory beside these, despite the implementation of the improvements (*Tamás – Fehér, 2012*).

The city, especially together with its agglomeration, makes up a significant proportion of Hajdú-Bihar county’s population. To protect the quality of its water resources, we should focus on projects on the target areas, which need developments. Swift implementation of development concepts is an urgent task, its backwardness even its delay can imply serious environmental and supply problems. The management of environmental effects at regional level calls for the effective solution of the problems, which is a very important priority by Debrecen urban function and the corresponding agglomeration areas.

### *The planned regional effects if CIVAQUA program*

The protection and sustainable use of our water resources requires responsible awareness of water management. Concerning Debrecen and its region, a water utilization project, the CIVAQUA was elaborated by the Local Government of Debrecen and Tiszántúl Region Water Directorate. The CIVAQUA program aims the utilization of the East Main Canal water simultaneously with social welfare, agricultural and environmental purposes. At the same time, the main aim of the program is the multi-purpose water supply, restoration of natural state and conservation of Great Forest. Nevertheless, the CIVAQUA, with its conscious and considerate steps, could have a favourable effect on the economic recovery of Debrecen and on the increase standard of living (*Szűcs et al., 2006; Baranyi, 1985, 2008*).

The justification of the set investments can be clearly supported. To improve the environmental condition of Debrecen is absolutely necessary in order to improve the quality of life. The rehabilitation of water supply of Great Forest in Debrecen is particularly important and urgent task. Taking into consideration of the aspects of tourism, it is essential to supply the water continuously in a controlled way in order to utilize the welfare lake system in Erdőspuszta, furthermore, to develop green corridor in the line of Tóció stream. In order to increase the yield of agricultural area in Hajdúhászás and on behalf of the safety production, it has become expedient to create the possibilities of irrigation development. In turn, the expansion of water sports and recreational opportunities could contribute to the welfare development in Debrecen and its agglomeration, respectively, the establishment of further water surfaces can contribute greatly to the city's microclimate improvement, to the dustfree air, as well as to the conservation of the vegetation and wildlife diversity (*Csatári, 2000; Nagy – Tamás, 2005; Orbán, 2010*).

The CIVAQUA program represents an added value at regional level too, beside the local welfare qualities and the preservation of natural values in Debrecen. If the multi purpose water management plan was achieved, Debrecen and its agglomeration could appear on the tourism market with such a complex tourist offer, where Hortobágy eco-, Hajdúszoboszló medical- , and Debrecen sport - , conference - , event tourism could be linked together and thus they will complement each other well. The CIVAQUA need to be regarded as a regional

complex system, which is a remunerative investment for the Northern Plain region, thus it is a common interest to achieve this as soon as possible.

***The actual and potential regional role of the Eastern Main Canal in the water supply of Debrecen and its region***

The Eastern Main Canal is an important surface water base as regards Debrecen and its region. Now this canal is for irrigation water supply, fishpond water supply, industrial water supply, ecological use of water supply, periodic inland decontamination, reed exploitation and for holidays. As well as, adjusted to the EU Water Framework Directive, drinking water is taken out from its bed. However, its water is vulnerable due to the pollutants which can possibly enter its water. Beside this, according to the experts the exploitation of layer water supply would not lead to long term potentiometric level reduction under the current water demands. The need for rehabilitation of works of art is an actual problem to be solved, discretion of risks of drinking water exploitation, the need to drain any inland inundation and the opportunities of the future exploitation of the Eastern Main Canal.

As regards of the utilization of the Eastern Main Canal, there are more perspective opportunities. As our surface waters are valuable, but at the same time they are vulnerable water bases (Kovács *et al.*, 2001), if the water supply is possible from layer water bases in a sustainable way, by all means it must be preferred. Quality ruin can happen due to its vulnerability and the implement of drainage, and the contamination from the Tisza. A suggested future solution could be if the KFCS would provide the technological water needs of the concentrated industrial sites.

However, this is not realistic at the moment; as such a degree of industrial concentration has not still been created in Debrecen, which would require such a large amount of water (Leentvaar, 2000). These sites use layer water at the same time consuming the surface water.

It can be concluded that the Eastern Main Canal became a part of a system in 1956. This system was created to ease the water problems in one of the driest areas of the country and thus this canal has become a part of an outstanding domestic water management in the Tiszántúl Region. At the same time the current and future role of the Eastern Main Canal need to be evaluated. The actual problems need to be taken into account according to the Water Framework

Directive, its guidelines concerning the Eastern Main Canal. These problems are: reconstruction of works of art, dangers of drinking water exploitation, drainage of possible inland inundation and the future opportunities of the exploitation of the Eastern Main Canal.

### ***The regional role of Debrecen Waterworks Ltd.***

The water utility service operated on regional level meets the government's concept as for the water bases. According to this concept, the water bases are the most important natural resources in Hungary and they have priority in protection. The regional service has to be able to create those conditions, which are necessary for such an operation where the drinking water supply is safe and economically recoverable, and it could provide development opportunities too. We must answer to the question too whether the system could provide high quality and affordable water service for everybody and beside this whether it could contribute to improve the abilities of the local governments as owners to make profit (*Kengyel, 2002; Vendola, 2011*).

The key goals of the different economic regulating means related to the area of expertise are the more efficient allocation of water resources and the risk associated with the manageable water. Beside this, it is also an important aim to achieve the objectives of the water policy, which targets a more sustainable and more reliable water management, with cost effective solutions (*Grasselli, 1998*).

Like in foreign examples, primarily the integration at regional level should be put forward because of the cost effective operation in Hungary. Although a number of studies were made, but so far none of them has been achieved. One of them is the Northern Plain Region Drinking Water Improving Program, which was created by Northern Plain Regional Development Agency in 2006. This project, feasibility pre-study, aimed the concentration of the water public utility service, and according to this the water supply problems should be managed in regions, in one package. This project made a suggestion for creating water supply systems in the subregions, namely several small settlements had the common water supply depending on the facility of environment and infrastructure of the settlements. The development project was made involving the following regional waterworks, local governments, respectively the water management and water service units: Eastern Main Canal site; Debrecen; Folk Art House; Debrecen –

Vekeri lake; Mikepércs; Home for the Elderly in Mikepércs; Sáránd; Hajdúbagos; Derecske; Hajdúszovát; Konyár; Hosszúpályi; Hosszúpályi – Sóstó; Monostorpályi; Létavértes; Kokad; Álmosd – Bagamér; Újléta; Vámospércs; Hármashegy-i look out tower (*NOGPRDA*, 2006).

Today, the water management has priority in the nation's strategy. According to the government's determination, it regulates the water public utility service of which base is the Act CCIX of 2011 on water public utility supply. Recognizing the necessity concerning economic, ecological, sustainability and national natural treasure protection, among other, in favor of creating the integration of water public utility suppliers, a mandatory element was introduced, which points in the direction that the integration processes could be realized not because the local governments can cooperate together but depending on the efficiency of the companies.

Larger scale integration would be justifiable at some county or smaller service system where the equivalent – indicator is 150 000. It can be exemplified well not only with foreign examples but with efficient water utility company, like Debrecen Waterworks Ltd., which could serve not only the county but a larger region in full extent and at high quality because of its high level of operational experience. Such a regional supplier would have the ability to operate significantly cost effectively, as it could continue its activities with reduced background administration and personnel apparatus, but with more impressive efficiency. As a result of changes, the additional costs could be saved, which has been validated so far in the consumer charges (*Rákosi*, 2011). The economic aspects, the larger ecological safety and a better protection of natural resources are the advantage of the regional size. However, beside these, another advantage would be that the supplying standard for the entire population of the whole region can be increased close to the same level.

The ability and possibility of expansion have always been in the operation of the Debrecen Waterworks Ltd., which has been manifested in the investments outside Debrecen. In its strategy plan until 2010, one of the main elements was to get the right to operate the water public utilities of the settlements outside Debrecen. The company aspires to serve on the foreign and domestic market as well. It has applied for water utilities services in a number of municipalities successfully, the company's water utility service expanded. In 2006, it founded its subsidiary operating in Romania (to fulfill the development and service tasks

in Székelyudvarhely, Nagyszalonta and Zetelaka). It had the possibility to prepare for the water utility service tasks within the region in 2006. It made economic calculation, development schedule for several settlements. In 2007 and 2008 it began the operation of water utilities in the Nyírség (Nyírlugos, Nyírmihálydi, Nyírgelse) and in the Hajdúság (Nádudvar, Biharkeresztes). The Debrecen Waterworks Ltd. practises the tasks undertaken in the operators and concession contracts; the managing of the data files was integrated into its economic processes. The integrated management system of Debrecen Waterworks Ltd was introduced in 2006, its further development included the expansion of sales activities, new elements were introduced into the integrated system (expanding the process control and installing it into the system). The Debrecen Waterworks Ltd. solved the fulfillment task of its sales activities by expanding the operating program (Ányos, 2009).

### ***Perspectives of the adaptation of the Dutch water public utility service in the Northern Plain region***

The question arises whether there is any European country that has the water features which can be compared to the features of Hungary, of which the water policy in the regional structure is realized more centralized and more rationalized.

Of course, it is necessary to examine the degree of centralization, the consumer price of the water, the profit-making ability, the structure of the ownership and the effects of the water policy on the water quality and sustainability as well (Hulsink, 2001; Baranyi, 2001, 2007, 2011).

Water resources of Hungary in both quantity and quality are unquestionable, yet we are faced with several problems. To control the pressure on the contaminated surface water by the „polluter pays principle” which is represented by the WFD and to decrease the depression of layer waters are very important. However, beside these to create a transparent domestic water public utility system, which using a uniform pricing policy, it could make it possible to have a drinking water management which is cost-effective and it could raise the water quality to the same level.

To the implementation, however, it is very useful to study the development aimed at the integration and regionalization of the water public utility, especially the use of the available positive international experiences.

The studying of the Western European, especially the Dutch – similarly the English – experiences warn us that the regionalization of the water management serves the efficiency of water public utility the most. (*Kuks, 2000; Ungvári – Koskovic, 2010*). Namely, the regionalization has more advantages:

- eliminate the fragmentation of water service based on self-government
- it can join the local energies, smaller – larger self-government and other water public utility companies into bigger regional units (eg. Debrecen Waterworks Ltd.), as well as
- it could ensure the technical and economic background to the fragmented units by creating an optimal plant size, thus giving the possibility to create harmony between the local and regional interest, a more ecological representation, as regards the ecological, water quality and economic aspects, meanwhile
- it reduces the excessive concentration of domestic water public utility service
- it terminates the numerous suppliers as for the residential supply

The adaptation of the Dutch model can also be relevant in Hungary because in sharing the services it represent decentralization, on the other hand actualizes integration with the regionalization of the services, mainly in the agglomeration and region of the major regional water public utility centers and decenters. This way, a reasonable and optimal diversification may be actualized in the field of the water public utility service (*Somai, 2003*).

Because of the above mentioned things, it is instructive to study the leading Western European examples in this field. Combining the adaptation of these examples and the local experiences and results, it may contribute to a cost effective and energy saving operation of the water public utility services. Beyond this, it can provide the sustainability of the environment and water base, in particular the unified water quality aspects.

#### 4. Conclusions and recommendations

It is necessary by all means to reduce the load and the use of the groundwater supplies in order to protect, respectively, to maintain the quality and quantity of the drinking water bases.

In this dissertation, we have evaluated the quality and quantity of surface and groundwater water supplies in Debrecen and its region trying to approach the water management questions in a complex way. Furthermore, we have studied the former, the current and the future concepts of the water utilization and waterbase protection, and the justification and reality of its realization, with a particular regard to the issues of the regionality.

The international experiences of the last decades have confirmed that hypothesis, according to which on the specific, monopolistic water public utility market, competition for more consumers cannot be spoken about. The economy is based strictly on the competitions, thus, in the case of privately owned operators, the profit is the biggest priority, while in the case of community – state or local government structure, the water public utility companies can be operated in a more balanced way, thus they can fully put across the more sustainable environment, quality and quantity consumer aspects. The Hungarian government wanted to create the exclusiveness as for the operation of the water public utility services by state and self government, adjusting to the *Act CCIX of 2011 on water public utility supply*, in which the unified, professional requirements system of the water public utility suppliers is an emphasised principle, as well as the realization of the water price policy is necessary to put the drinking water bases into a good condition in order to provide a long term use of it.

According to the experiences, the service charges are often high at the private firms contrasted with the water public utility suppliers owned by the community, because these charges contain not only the average costs and the return of the investments but the profit of the investors as well. On the specific monopolistic water public utility market, we cannot speak about the competition for more consumers, on the other hand, according to the experiences the operators try to avoid the competition with each other. Taking into consideration that we can meet owner's deprivation beside the prices kept at low, which risk the safety of the operation, as for the self-government owned companies in small settlements. Thus, it can be stated that from the community owned water public utility service forms,

beside the regional self-government structure regulated by the state, the form operated by the state can provide the conditions and sustainability aspects of a long term balanced supply standard.

H.1. According to the above mentioned, it can be stated that community owned and operated water public utility companies serve better the sustainable protection of the natural resources and the interest of the country's inhabitants than the private owned and operated companies which work strictly on market base.

The pre-study of the Water Quality Improvement Program, which was made by the Northern Plain Regional Development Agency in 2006, aimed to handle the water supply problems in one package, separately in administrative regions. This project made a suggestion for creating water supply systems in the subregions, namely several small settlements had the common water supply depending on the facility of environment and infrastructure of the settlements. Although the project of the program seemed to be feasible, however, the realization failed to come.

The current water management form cannot be maintained for a long time, since in many cases it does not provide coverage for amortization, for significant part of the maintenance costs, for replacement and development of assets. It must be managed as a fact in terms of the mayors and self-government managers that as for the water base protection and economic aspects, the future of the water public utility service lies in its integration.

Thus the resource demand can become solvable, which is needed for collecting and purifying the waste water in order to reduce the environmental problems and to prevent the damage of waters according to the Water Framework Directive.

Beside the community owned and operated water public utility structure, the supplying standard of the regional population can be lifted to almost the same level, which is meant for the water quality, the water safety and the continuity of the service, meanwhile these do not appear in charges differentially.

If the one county – one operator organizational structure could be feasible in Hajdú-Bihar county, then on the basis of this operating example, county level operating organizations can be formed in the surrounding counties as well. Adopting the effective example, these county level organizations would be more

and more interested in the effective operation, and it is obvious that these organizations could harmonize their more and more duties at regional level too.

Operation of the water public utility service at regional level meets the concepts of protecting the water base, as the Hungarian most important natural resource, on the other hand, it could create those conditions, which are needed to operate the drinking water supply safely, economically recoverable, and also could provide the development opportunities. This system would be able to provide good quality and affordable water services for everybody, and on the other side it could be profitable for the owners, namely for the self governments.

H.2. According to these, it can be stated that the organizing the water public utility service at regional level is more beneficial than the decentralized, fragmented service structure.

Examining the larger scale integration beside the concepts of the subregional systems, it can be seen that an effective water public utility company, like Debrecen Waterworks Ltd., with its high level of operational experience, well organized serving apparatus, it could serve fully a regional sized area. A regional supplier can realize a cost effective operation, since it could operate with reduced background administrative and personnel apparatus, but it could conduct the business efficiently. As a result of this, additional costs can be saved, which have been appeared in the consumer charges.

H.3. Thus, on the basis of our detailed studies we can state that the Debrecen Waterworks Ltd. is able to meet the challenges of the region centre role.

## **5. New or innovative scientific findings of the dissertation**

1. This was the first time that complex analysis for Debrecen and its region has been made for the situation of the water supply and the development possibilities at regional approach.
2. On the basis of the comparative analysis between the Dutch model, which has already been implemented and it is a well-operated regionalized water public utility model, and the current, fragmented Hungarian system; factual recommendations have been made for the regionalization of the domestic

water supply, and as a part of it for the region's central role of the Debrecen Waterworks Ltd.

3. The base thesis of the research has been managed to justify scientifically, according to which, by the reorganization and operation of the water public utility service at regional level, on the one hand, it meets the concept of the government concerning the emphasized protection of the waterbase, like strategic national treasure, - at the same time, it would be able to create the condition system of the drinking water supply, which can provide a more economic, safer and more sustainable operation and development compared to the former condition systems.
4. It has been justified as the result of the research that community owned water public utility companies serve better and more efficiently the sustainable protection of the natural resources and the interest of the population than the strictly market based privately owned and operated companies.
5. It has been proved that the Debrecen Waterworks Ltd. is able to meet the challenges of the regional, moreover the inter-regional role, meanwhile by the regional level organization of the water public utility service, it can become suitable in the future to operate a more sustainable and more effective regional supplier system instead of the too decentralized service structure.

#### ***Useful results in practise***

1. Useful recommendations have been composed for regionalization of the water public utility service in Debrecen and in its wider region, as well as for the possibility to realize the regional central role of the Debrecen Waterworks Ltd.
2. It was found that the point of view of the mayors and self government managers it must be handled as a fact that primarily the integration serves the future of the water public utility service not only from the point of water base protection but from economic point too, by which the resource need can be satisfied in order to realize the Water Framework Directive.

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