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Changing Focuses Through the Progression of Hungarian Water Management

Abstract
Hungary is one of the best examples to represent the manifestation of hydrological extremes. Studying the history of Hungarian water management and examining our present show how water management has developed. As time passes, changing job scopes and the expansion of available tools are recognisable. During the development, water management experts have been heading from ad hoc interventions to coordinated complex planning and in the meanwhile the process shows in which direction the focus points have changed. The aim of this paper is to explore the way Hungarian water management is heading under the changing circumstances. It examines the place and role of Hungary in the development of water management. The author researches the correctness of the direction of development and the change of focus points in comparison with other countries. Building on past experiences, this paper seeks the answer for the question how water management will be in the future. Research results provide guidance on how Hungarian water management can be at the forefront of future modern water management.

Keywords: water management, engineering, development, history, future

Introduction

Water as an essential material plays a central role in life. Preserving the quality and quantity of water is one of the most important responsibilities of every nation. For this reason, water issues need to belong to the main focuses of public service, too. The nature of water is dichotomous as it ensures our very existence but also might destroy us. Our relation with water has always been particularly important. Valuation of actions might not be considered static under dynamically changing conditions. Planning processes are multi-factored and they change

according to the new demands on society. Throughout history, both water utilization and protection against water damages have been emphasized as key issues in Hungary. Extreme hydrological events occur frequently in Hungary. After the research of Hungarian water management, it is recognizable that ad hoc interventions turned into coordinated complex planning through the years and it can be noticed how the focus points of water management have changed over time. With the expansion of available modern tools, the job scope broadened. It is noticeable how the emphasis changes from building conventional big infrastructures towards informatics. I consider it important to notice that individual interventions in the past can only be evaluated ethically in the spirit and context of the given age. The question arises, where water science is heading to in the future? How the focuses have been changed as time passes? Do water management experts follow the right direction?

It is reasonable to assume that the focus of water management changes by the development over time. The goal of this article is to explore the changing directions of Hungarian water management and examine how the focus points changed along the journey. The research is based on the synchronisation of Hungarian water management development and its triggers. Conclusions might not be considered ultimate but they state recognitions based on the facts of our current knowledge and hopefully these can be useful regarding future's water management issues. Research results provide recommendations on how Hungarian water management could belong to the forefront of modern water management.

The Beginnings

What is water management? Shortly, water management is a planned activity to harmonize hydrological conditions with needs of society. The 'content of water management' has been constantly evolving as science is developing. The available toolset has grown. Over time, the concept scope of water management expanded but its main principle has always remained the same. It is discussed in more details in the chapter 'Classic Water Management'. Water-related interventions were always part of people's lives, but in the beginning water management did not exist in the classical sense. Given interventions were consciously carried out but not coordinated on a wider scale and there was a lack of comprehensive approach. In this chapter, I intend to show the beginnings to understand the triggers, but I do not consider these actions as 'water management'. I highlight only the main events shortly, without the aim of giving a deep and

complete historical overview. The following events serve as a good illustration to show the large-scale water-related interventions made by Hungarian predecessors. I deem the publication of Zsigmond Károlyi as the first comprehensive collection of Hungarian water management history (Károlyi, 1960). The pursuit of water damage remediation and water utilization has accompanied humanity since its inception.

Firstly, the emphasis was put only on the utilization of waters without any interventions. Over time, the idea matured in people to interfere in the given conditions and to try to protect themselves or to reach more effective water utilization. The earliest data about Hungarian water regulations are available from the 13th century (Bobics, 1885). At the former territory of the Hungarian Kingdom, Queen Mary, the wife of King Béla IV. ordered to dig a new canal for the Danube from Bratislava to Gönyű to protect their estates of Magyaróvár from floods. More specifically it affected the Great Rye Island and the Kisalföld region. An important milestone and source is the '*Tripartitum opus juris consuetudinarii inclyti Regni Hungáriáé*' in the Latin language (Werbőczy, 1514). It is the collection of customary laws of the country from 1514. It contains the legal background of property issues caused by changing riverbeds and property rights related to flood embankments and milldams. It states the necessity of private property restrictions in the case of water regulations.

The first Hungarian source about a flood embankment restoration is available from 1569.[1] King Maximilian I. (he is from the Habsburg dynasty) ordered in his decree in Article 21 to restore the damaged embankments of Great Rye Island. During those times these works were carried out by affected counties and were not financially supported by central funding. As an example, the Third Decree of King Matthias II. from 1613 marks the defence against the flood of the river Tisza as a duty of affected parties, the counties.[2] (The Hungarian Kingdom consisted of counties). He ordered the affected counties to build embankments against flooding to preserve their assets and let the arrangement be made among them. The territory of Hungarians was severely affected by flooding and constant water coverage was high. At that time, the main focus was on flood protection and probably flood protection was not synchronized with water regulation interventions yet. The first source about centrally financed works is a law by King Leopold I. from 1687.[3] He ordered it related to the danger posed by the river Vág and Danube. He appointed commissioners to examine the issue.

1 Law XXI of 1569 on transfering the work of Bratislava and Komárom counties to the embankments of Danube at the Rye Islands.
2 Law XXVII of 1613 on making embankments against the flooding of the Tisza and other rivers.
3 Law XVI of 1687 on appointments of commissioners to examine the River Vág and the Danube.

To understand the development process of water management, we need to examine it in the context of history. Historical conditions fundamentally determined its speed of development. From the beginning of the 16th century, the Hungarian Kingdom waged wars against the former Ottoman Empire for over 150-200 years. During this time a significant part of Hungarian territories was occupied by the Turks and it led to deterioration and a substantial part of the country depopulated. In the late 17th and early 18th centuries, it became important to settle the degraded water infrastructure to rebuild the economy of the country. Water canal and water regulation plans were made by Dutch and Belgian engineers to help improving the economic situation. But due to lack of finance only a few plans were implemented. Navigation started to be in the focus to enhance the recovery of the economy. In 1723 the Royal Council of Governors was committed to turn various rivers and canals navigable to reach different areas to facilitate trade and thereby repopulate deserted areas.[4] In the following years, during the reign of Queen Maria Theresa (1740-1780) further steps were made to improve navigability.[5] The Institute of Engineering (Institutum Hydrotechnico-Geometricum) was founded in 1782, on the effect of Maria Theresia, by King Joseph II. (Fodor, 1955). It was an important milestone in education. The institute required 2 years of internship after 3 years of theoretical education. It was the second institute in Europe where the technical sciences were educated at university level. It probably significantly contributed to the development of a knowledge base in the area of water management in the following years.

In 1793, the Kingdom of Hungary started to build its first - and for a long time only - shipping canal according to the plans of József Kiss and Gábor Kiss (Kiss, 1792). The canal was named after Franz Joseph Carl von Habsburg-Lorraine, the King of Hungary as Ferenc I. The 238 km long Ferencz Canal was handed over to traffic in 1802. It was then the largest canal in the world that was navigable even by 650-tonne ships, while other European and American canals were suitable for 200-300-tonne vessels only. Figure 1 shows the plan of Ferencz Canal.

4 Law CXXII of 1723 on the installation of canals.
5 Law XIV of 1751 on the elimination of mills that are harmful to the community.

Figure 1: *Ferencz Canal*

Note: URL1.

In general, the development progressed from ad-hoc symptom-based interventions to the direction of more profound transformations. Before the 19th century, the most crucial problems were the frequently flooded large areas with constant

water coverage and the issue of navigation to reinforce the economy. Before the 19th century, Hungarian water management had not existed yet but its roots are detectable. Based on the foundation of high-level education, the 19th century brought the golden ages of Hungarian Water Management.

Classic Water Management

I deem that the beginning of classic water management in Hungary derives from the publication of József Beszédes's book in 1831 (Beszédes, 1831). He was the first to define the concept of water management in Hungary. He stated that water management is a science that is about making plans to manage and regulate water while taking into account the social and geographical situation of the river basin. As its goal, he defined the elimination of water damages and water utilisation. I consider his definition of water management very similar to the current generally accepted definitions. According to him, at that time there had not existed any country with national scale water management. Already in 1831, he recognised the importance of water basin perspective and he highlighted the difference of country border and river basin border. Beszédes recognised the necessity of coordinated planning on country-scale to avoid works that hinder each other. So, the catchment-level approach already emerged in 1831. At that time, water engineering in Hungary was only limited to carry out more or less independent water developments and there was a lack of unified water management activities.

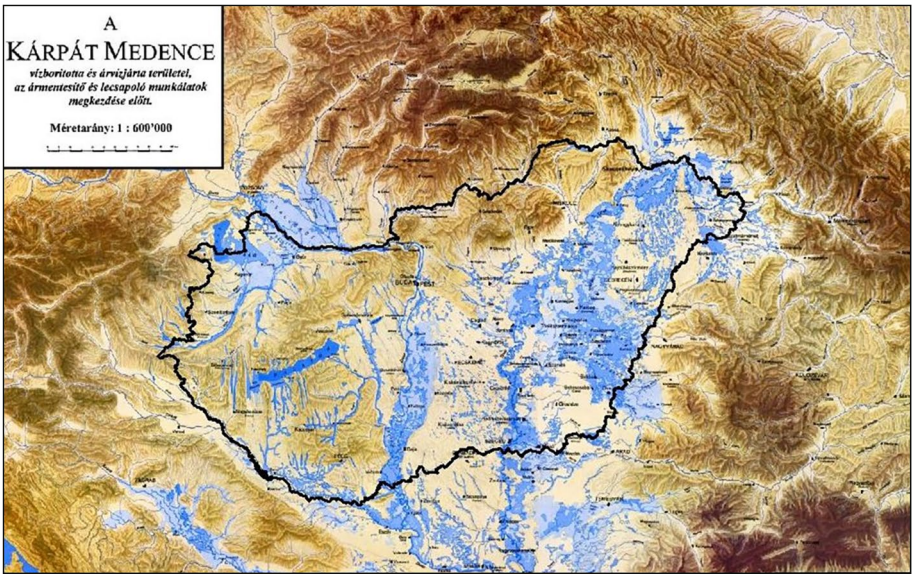
At the beginning of the 19th century, the Napoleonic Wars led to inflation and economic crises in Hungary. The demand for reforms emerged in society. Count István Széchenyi's reform program had brought the change in political views and society (Széchenyi, 1830). In his publications he noticed the importance of a regulated Danube and argued for the regulation of the Danube by presenting the positive economic effect of the regulation (Széchenyi, 1831). He fitted this high-profile water management program into the context of economic development (Széchenyi, 1833). Water regulation leads to safety and better navigation conditions for transport, which might increase trading. It would be followed by the strengthening of the industry that could lead to producing more profitable processed products. Along with this logic, the water regulation ultimately leads to the rise of the Hungarian economy (Széchenyi, 1831).

During this period the coordinated regulation of rivers was on the agenda. A comprehensive hydrological survey had already started at the main rivers in the 1830's. Floodplain areas of the river Tisza surpassed the Danube so the

issue of Tisza came to the fore. Large-scale plans were made by Pál Vásárhelyi recognised even by foreign experts (Károlyi, 1960). According to the plan of Vásárhelyi, Széchenyi started the regulation of the river Tisza in 1846. Figure 2. shows the permanently waterlogged and the temporarily flooded areas in the Carpathian Basin before the water regulations. Permanently waterlogged areas are in dark blue and temporarily flooded areas signed by light blue.

Hardly the water regulations started, the historical circumstances led to one of the most remarkable events of Hungarian history. In 1848 the Hungarian Revolution and War of Independence broke out, but the revolution was surpassed in 1849. Due to troubled historical circumstances, water-related developments were hindered. The issue of water regulations was reset on agenda only after the Austro-Hungarian Compromise of 1867.

Figure 2: *Permanently water covered and temporarily flooded areas in the Carpathian Basin before the water regulations*



Note: Hydrological Institute of Hungarian Royal Ministry of Agriculture, 1938.

In Hungary, due to the low-gradient river sections and the plain areas, flood management was still among the most urgent issues (Kvassay, 1917). Hungary founded the Institue of Water Engineering in 1879 under the direction of Jenő Kvassay (Kvassay, 1880). After the establishment of the institute the flood management and drainage works started to continue rapidly. The significance and volume of the work can be illustrated well by the fact that Kvassay referred to

it as the 2nd Hungarian conquest of the homeland (Kvassay, 1917). As an effect of water regulation, the cultivated land increased by nearly 30% and it made possible the increase of population by more than a third. The population of the country was 11,554,377 in 1850, and 15,739,259 in 1880 (Károlyi, 1960). Water management issues were merged under the scope of the Ministry of Agriculture in 1889.[6] The first and foremost task of the water management under the Ministry of Agriculture was to prepare an integrated plan and program to continue the regulation of River Tisza.[7] Subsequently, integrated plans were made for the Danube and other major rivers of the country. According to the new plans, they started the regulation of the rivers Kőrös, Bodrog, Szamos and Dráva. 106 million m^3 of ground were moved during the work. To represent the size of the work, if we put the amount of ground moved on a rail, we would need 19 million 10-ton wagons. The train would be so long that it would circumnavigate the Earth almost three and a half times (Lászlóffy, 1940). The work done was also outstanding by European standards. Several foreign delegations participated in study visits. In the following years, as a result of the measures taken in the field of flood management, the situation has improved. Embankment construction progressed well. The effectiveness of flood management has been increased further by the development of the telephone network and also several pumping stations were built. River regulation works also benefited shipping. Hungary was willing to improve its waterways. Improvement was important for both domestic and foreign trade. Hydraulic engineering was developed further by Szilárd Zielinski, who introduced the use of reinforced concrete in Hungary. The ship sluice of Bökény designed by him is one of the first sluices built of reinforced concrete (Károlyi, 1960).

Other than water regulation, we know that one of the key parts of flood management is forecasting. The first experimental water level forecasts were already made in 1889, based on a method developed by József Péch. The first time the forecast was applied during the flooding of the Tisza in spring 1890 and they even published results on the expected water levels. At that time, water level forecasts were issued only in France and the present area of Czech Republic so it was a significant achievement (Lászlóffy, 1956).

Improvement of soil conditions and irrigation progressed more slowly. Isván Türr, who was one of the outstanding engineers of that age, argued for irrigation development. The Corinth Canal was built partly based on his plans, and he was

6 Decree 103 of the Royal Hungarian Trade Minister and Agricultural Minister in accordance with Law XVIII of 1889.

7 Law III. of 1894 on the further water regulation of the Tisza and Bodrog and on the relocation of the Ferencz Canal Estuary at Tisza.

also involved in designating the route of the Panama Canal. He approached the issue of irrigation from the point of view of economic development and set it in parallel to railway developments. He deemed that too many railway networks had been built too fast. Due to the large loans taken for railway development, not enough financial possibility remained for the development of irrigation. The expensive transportation costs and the repayment of the loans and interests hindered the development of agriculture and thus the national wealth (Türr, 1880).

Drainage was also important regarding drinking water quality and public health. Before drainage, the available water resources in the Hungarian Great Plain were of poor quality. Previously, artesian wells were not drilled, from which the population could have obtained good quality filtered water. At the turn of the century, significant progress was achieved in sewerage and water supply. Drilling of artesian wells spread to support drinking water needs. Experts recognised the necessity of addressing the issue of drinking water supply and sanitation in a coordinated way. It is interesting that in 1917, Jenő Kvassay, director of the National Hydraulic Engineering Directorate, evaluated the water management policy of the last 40 years, he considered the achievements in terms of water quality protection good and he ruled out further deterioration of the situation. Recently we know that water quality problems are far away from being solved. New emerging pollutants and microplastics pose risks.

Hungarian water management had already assessed the hydropower potential of the country in 1905. The result of the state scale assessment was published in a book titled 'Hydropower of Hungary' (Viczián, 1905). After some years, due to World War I (1914-1918), Hungary had to import a significant amount of oil and coal to generate electricity so Jenő Kvassay as a water manager deemed it also necessary to consider the untapped hydropower potential. Due to the lost world wars, the question of hydropower potential was stuck in the background in the following decades until the controversial bilateral issue of Gabčíkovo-Nagymaros hydroelectric dam project. After this debated issue the hydropower potential of Hungary mostly remained untapped and in the following years the attention turned to nuclear energy and renewable sun and wind energies. Due to industrialization, different interests and various water needs emerged and it induced the conscious management of water resources. In 1952, Hungary founded the Research Institute for Water Management. (Unfortunately, in the meantime the institution was abolished.) The first task of the institute was to size up the country's water resources and make water resources plans. The quantitative survey of water resources was completed in 1954, and then the qualitative survey was finished in 1958. These surveys were the base of planned water management. I consider the establishment of the institution

as a noteworthy step on the way to develop modern water management. Also, it was time to establish planned and unified water management. Independent public water administration was founded in 1953.

Some recognized the importance and the potential of a common joint forum to collect and share theoretical knowledge and practical experiences. There was a need for a scientific paper. So, they started to publish a new journal named '*Vízügyi Közlemények*' (Water Management Journal) regularly and it played an important role in knowledge development of the water management society. The Journal served as a common platform for knowledge sharing and it helped to trigger discussions. It represented a cohesive force. Jenő Kvassay noted that beyond the scope of a specialised technical paper, engineers need to consider even the economic, administrative and legal aspects of their job. He stated, '*... without these we could only be highly educated but remain one-sided people.*' (Kvassay, 1911). They recognised the role of self-education. Expanding of knowledge contributes to the general progress of the nation.

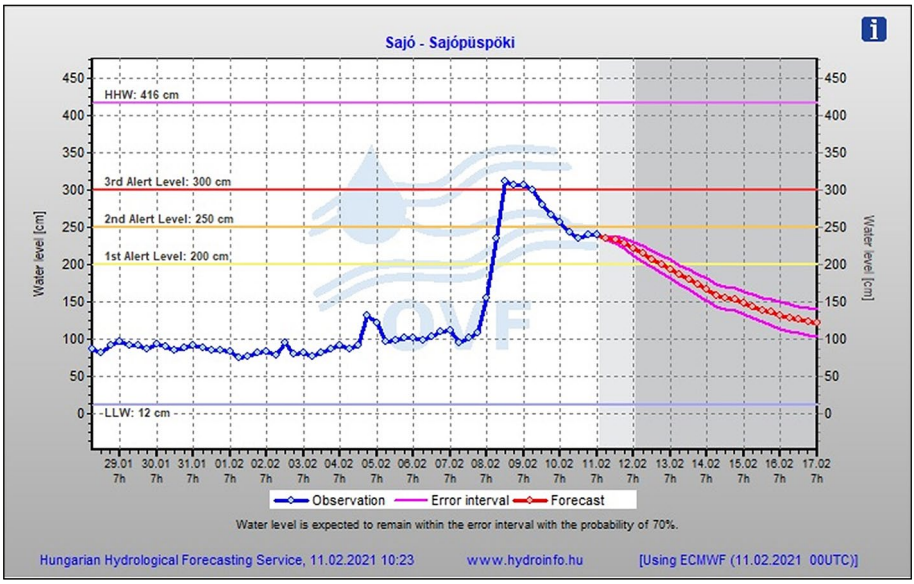
In summary, during this age the development of technology made the implementation of the most important classic water infrastructures possible. Hungarian predecessors achieved remarkable results in many aspects of water management. They implemented the infrastructural base of further development. Leading experts had recognized the economic context of water management. They understood the nexus of river regulation, navigability, agricultural water management and trade and sought to design measures accordingly. After this era, I consider the spread of information technology as the new engine for further water management development.

Modern Water Management

The advent of computer technology and the Internet has brought a radical change in water management. The beginning of modern water management can be traced back to the time of computers and the birth of hydro-informatics. Research focus has shifted to informatics from the late 20th century and in the 21st century. Previously unimaginable perspectives have opened in water management due to the application of information technology. However, we must not forget that the new possibilities might bring new dangers, too, so the application requires caution and professionalism. Computerization has led to significant improvement in forecasting. Modern water management is heavily based on data collection, data processing, and therefore on data-based monitoring systems. A new dimension opened in hydrography also by the significant amount

of information and automated measuring stations. Forecasting is based on monitoring systems. Specialists are constantly working on refining the forecasts by model developments or improvements. Figure 3 represents a 6-day hydrological forecast for the river Sajó.

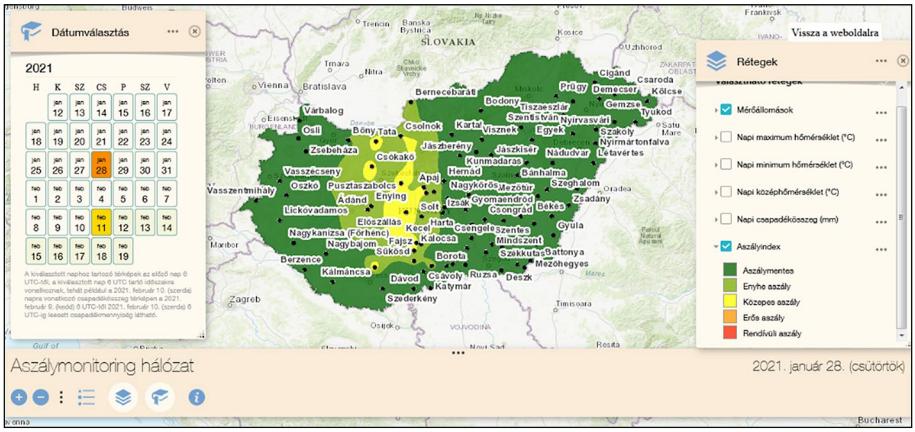
Figure 3: *Hydrological forecast for the Sajó at the station Sajópüspöki*



Note: URL2.

Different types of modelling also belong to the toolkit of water management professionals. Modelling can be successfully applied to sizing water networks, examining runoff conditions, valuing risk management, etc. Data management is a key factor as being the essence of modelling. New tools help to prepare and facilitate conscious planning. For example, Figure 4 shows the drought and water scarcity monitoring system developed and applied in Hungary.

Figure 4: *Operational Drought and Water Scarcity Management System*



Note: URL3.

The monitoring system calculates indicators based on various data gained from monitoring stations and is able to provide a few-day forecast by interpolation for the area of Hungary.

In terms of remote sensing, we can state that nowadays the way is open to apply satellite-based remote sensing. It can be suitable to detect environmental changes. It can be mentioned that the application of drones is rapidly spreading also in water management in the 21st century.

The recognition of climate change has also emerged as a new key factor in water management. Considering climate change, previous measures might get a new aspect. Climate change as a phenomenon was not yet known during the age of classic water management and therefore engineers could not plan with it. Past actions can be assessed only by having regard to this fact. Due to climate change, searching for new innovative solutions must be encouraged. Climate change gets into the major focus of water management experts. Due to climate change, the attention of Hungarian experts turns to both flood risk mitigation and water retention.

Concerning public utilities, it must be stated that the piped drinking water supply and wastewater drainage developed a lot in the 21st century. Hungary is almost completely covered by piped drinking water supply (over 95%) (URL4). Both the development of water purification and wastewater treatment technology improved significantly in the last decades and it is still progressing. It is in line with other European countries.

Regarding the international context, the reinforcement of common water policy was a milestone in water management. The European Union (EU) established

a common water policy called Water Framework Directive in 2000.[8] It came into force to preserve and improve the quality and quantity of European waters. Hungary became a member state of the EU in 2004 therefore common principles must have been adopted. The directive turned the focus of Hungarian experts on water resources management, water quality and caused strengthening of international cooperation. Hungarian water management places great emphasis on participation in international working groups and committees. Comparing it to the age of classic water management I can recognize similarities. Even hundred years ago the CEO of the Institute of Water Engineering considered gaining foreign experience important e. g. 18 out of the total number of 37 employees were attended foreign study trips (Kvassay, 1890). In line with this I deem the reintroduction of longer study trips at least as important as attending in working groups. I recommend reviving this activity after the end of the COVID-19 pandemic in order to be able to gain deeper knowledge based on foreign practice. I suggest placing more emphasis on engaging in further international projects. In line with international aspirations, the importance of nature conservation and environment protection has increased in Hungary, too. Applicability of nature-based solutions is coming to the fore and sustainability is getting more important. Researchers work on facilitating circular economy.

It can be noticed that emphasis shifts from large-scale investments toward the direction of small-scale complementary interventions. The more infrastructure is being built the more maintenance and reconstruction is needed, so in countries with developed water-related infrastructure the role of maintenance and reconstruction will get in front of building over time.

I state that previously applied approaches during the time of classic water management were strongly technic- and economic-weighted and at present, it seems to be completed by more environmental awareness. Currently, the implementation of integrated water management is an actual challenge concerning socio-environmental-economic needs (Ijjas, 2019). I examined the leadership of the Hungarian water management. In terms of the institutional structure, it consists of 12 regional water directorates coordinated by a central institute named General Directorate. In total, it means 13 directors and 13 chief executive engineers. I stated that there is not any female person among these leaders. In my research, I stated that there has not been any female director yet in the course of Hungarian water management history. I suggest strengthening the role of women in the future. Education needs to be modernized in line with rapidly progressing digitalization.

8 Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Acquisition of specialized IT skills has to be the focus of Hungarian water management courses. I believe that water professionals might reach outstanding results in the future if they will be able to combine their engineering knowledge with IT development skills. Digitalization belongs to the area of modern water management that is waiting for the most to be discovered in the following years (URL5). I believe that the potential of artificial intelligence (AI) offers versatile solutions in practical water management. I think the practical application of AI will be marked as an important milestone in the history of water management if future generations will look back to our present time. Using machine learning, neural networks, etc., as artificial intelligence tools, might be useful for example in forecasting, optimization, decision-making support and so on. Researching the application of AI in water management might be the next breakthrough point for water management in the next decades. Developing a national digital water management strategy would be appropriate to set directions. International Water Association (IWA) published a document that contains a good illustration of versatile applications of AI and gives a comprehensive picture of the latest researches in Singapore (NG, Seah & Pang, 2020).

Conclusions

Having regard to water science, researches are widened and accelerated. Over time the number and diversity of water related scientists increased. Versatile experts and expanded knowledge made improvement of Hungarian water management possible and caused the blurring and spreading of focus points. Based on this research, it can be stated that the focus points of water management are not constant but dynamically changing over time. According to this principle, the focuses might alter continuously even in the future. The visions of engineers change and the role of nature, environment and sustainability get more emphasis as the decision-making processes become less economic-weighted. I consider it crucial to implement the inseparable technical, economical and environmental unity approach in order to do effective and sustainable future investments and plans. Understanding the history of development of the Hungarian water management can play an important role in guiding future complex engineering thinking. Comparing the present different individual disciplines to the age of classical water management, it can be stated that the disciplines are highly fragmented. It might easily lead to self-serving science, so in order to avoid it there is a need to have a clear guideline. Synthesizing fragmented research results is key in the direction of common development.

In many cases, the problems of the present are rooted in the past and solutions are already found by our predecessors. With our new technical abilities and skills, it is worth researching how experts in the past were thinking about a given issue. We should analyse their conclusions and solutions and examine if it is possible to address and apply them under the current circumstances. Addressing extreme events due to climate change, urbanization and demographic changes pose a new challenge for modern water management professionals so the education system needs to be adapted to these changing conditions. In the near future, focus turns to the application of artificial intelligence in water related issues. I believe that the application of AI will be the leading research area of water management by 2025. Digitalisation will be in the main focus of water management until 2050 at least. New outstanding results will be available by the combination of engineering and IT development skills. Acquisition of programming skills will get more emphasis. Therefore, new coding and other special IT skills need to be trained more by education to be able to reach significant results in applied science. By utilising the hidden potential of AI could the Hungarian water management reach a ground-breaking result and make significant progress in the coming decades. It would be appropriate to develop a digital water management strategy. Awareness of society might be improved by a stronger presence of Hungarian water management in the online space via social media. I stated that there was not any female director in the almost 150 years old history of Hungarian water management. Although the number of women involved in water management increased, I suggest further strengthening of the role of women.

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Laws and Regulations

1569. évi XXI. törvénycikk Pozsony és Komárom vármegyék munkája felének, a szigetbe áttétele a Duna viztorkolása gátjaihoz és töltéséhez [Law XXI of 1569 on transfering the work of Bratislava and Komárom counties to the embankments of Danube at the Rye Islands]
1613. évi XXVII. törvénycikk, hogy a Tisza és más folyók kiöntése ellen töltéseket készitsenek [Law XXVII of 1613 on making embankments against the flooding of the Tisza and other rivers]
1687. évi XVI. törvénycikk a Vág és a Duna folyók megvizsgálására biztosokat neveznek [Law XVI of 1687 on appointments of commissioners to examine the River Vág and the Danube]
1723. évi CXXII. törvénycikk csatornák berendezéséről [Law CXXII of 1723 on the installation of canals]
1751. évi XIV. törvénycikk az országban a közönségre nézve káros malmok megszüntetéséről [Law XIV of 1751 on the elimination of mills that are harmful to the community]
1894. évi III. törvénycikk a Tisza és Bodrog mellék-folyó szabályozásának folytatólagos munkálatairól, valamint a Ferencz-csatorna tiszai torkolatának áthelyezéséről [Law III. of 1894 on the further water regulation of the Tisza and Bodrog and on the relocation of the Ferencz Canal Estuary at Tisza]
A kereskedelemügyi m. kir. minister és a földmivelésügyi m. kir. minister tájékoztató 103. rendelete, az 1889. évi XVIII. t.-czikk értelmében megállapított ügybeosztás tárgyában [Decree 103 of the Royal Hungarian Trade Minister and Agricultural Minister in accordance with Law XVIII of 1889]
Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

Reference of the article according to APA regulation

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