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FLOOD PROTECTION DEVELOPMENTS ON SAJÓ-HERNÁD RIVERS IN RELATION TO THE 2020 FLOOD EVENT

ÁRVÍZVÉDELMI FEJLESZTÉSEK A SAJÓ-HERNÁD FOLYÓKON A 2020-AS ÁRVÍZ TÜKRÉBEN

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Abstract

In my article I introduce the developments of the rivers Sajó and Hernád after the floods of 2010 and the effects of the floods in 2020. I highlight the impact of flood developments and necessary improvements to support the flood control activity to be carried out.

Keywords: flood, flood protection, river, EU Flood Directive

Absztrakt

Cikkemben az Észak-Magyarországi folyók közül a Sajó és a Hernád folyó 2010. évi árvizei után elvégzett fejlesztésekkel és a 2020. évi árvizek hatásával foglalkozom. Rámutatok az árvízi fejlesztések hatásaira és a még elvégezni kívánt, védekezést segítő beavatkozások szükségességére.

Kulcsszavak: árvíz, védekezés, folyó, EU irányelv

Introduction of the Flood protection status and the flood protection problems

In my article, I will compare the 2010 flood protection of the Sajó and Hernád rivers with the 2020's flood protection activities. Significant flood protection developments have taken place in the Sajó-Hernád Valley since 2010, but there is still work to be done. The main task is ensure the proper flood safety and avoid flood-related significant dam-

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ages. To write my article, I used the summary of flood protection summaries, concept of flood protection development and placed all of them among the requirements of domestic and EU legislation and Directives.

This article supports my doctoral dissertation which is engaged the differentiated flood protection at the Doctoral School of Military Engineering of the National University of Public Service. In the development of differentiated flood protection, the flood protection sections are needed to pre-rank that the recent flood interventions have affected and relatively low cost expenditure can achieve the greater flood risk reduction on the protected side or the endangered area. These written viewpoints prevail in the differentiated flood protection in the Sajó-Hernád valley.

In May and June 2010 due the extreme rainfall in the river basins there were extraordinary flood events on the Hungarian Rivers and watercourses. The Sajó, Hernád and Bódva Rivers jointly flooding caused critical situation in Borsod-Abaúj-Zemplén County. The Government of the Republic of Hungary declared emergency situation in the whole area of Borsod-Abaúj-Zemplén County due extreme flood situation. Flood and excess water protection activities had to be carried out in 208 settlements in the County. About 11 500 private and municipal and about 100.000 people were threatened by this flood event. There were enormous damages in the flood protection structures and in agricultural areas. 4643 people were displaced during this extraordinary flood event, seeking for temporary refuge in their relatives or municipal properties.²

After this extraordinary flood event flood restoration tasks and the most necessary construction works were carried out to increase the flood safety, as decided by the Hungarian Government. The flood protection interventions were implemented only the most vulnerable areas.

Based on the experience of floods in recent years the review of the flood design water level (FDWL) was done in 2014. The new flood design water levels (FDWL) were promulgated in 74/2014. (XII.23.) decree of the Minister of Interior. On the Sajó and the Hernád Rivers the new flood design water levels are on average 50-150 cm higher than

² The final report of 2010 flood protection activities – Hungarian General Directorate of Water management

before. Due the new flood design water levels the former height deficit on the flood protection structures continued to grow.

There were prepared a flood control concept on the whole Sajó and Hernád River valley in the framework of an EU project. The result is the documentation entitled “Flood protection development of Sajó-Hernád”³, which is a flood protection development concept based on the new flood design water levels and the experience of floods in recent years by examining the possibility of establishing flood protection reservoirs.

The purpose of the flood protection development, expected results, connection with national and EU directives

The purpose of the flood protection development contains the most urgent ranked flood related interventions on the Sajó-Hernád Rivers.

It is an essential aim to improve the flood protection system by building the proper height and section of flood protection dyke in the shortest possible time in order to ensure the safety of the people and the infrastructure on the endangered area.

Other important goal is improving the safety of protected floodplains by development current flood protection dykes, building new flood protection dykes for the new flood design water levels and the implementation of the related infrastructure developments. As a result of the project the flood protection safety of the area affected by the development is increasing.

It is a fundamental aspect in the development of the concept and in the project to create harmony with the EU Directives establishing a framework for community action in the field of water policy. These Directives are the Water Framework Directive (WFD) and Flood Directive (FD). There was another key consideration was to establish maximum consistency with the under preparation of riverbed management plans.

³ Flood protection development of Sajó-Hernád – Hungarian General Directorate of Water management

The European Union accepted the Directive 2007/60/EC on the assessment and management of flood risks (in the following: Flood Directive) in 2007. Hungary has also accepted the application of Flood Directive. This Directive aim are reducing flood risk aligned with the European Union Water Framework and mitigating the adverse effects of floods in the European Union. The Directive require the negotiation about the flood risk management beyond the national borders and encourages with commitment to improve the transparency and involve the citizens. It is now obligatory for the EU Member States, including Hungary, to define the River basins and the associated flood-prone areas and preparing flood risk and flood risk management plans these areas.⁴

The river basin management plans aim the implementation of Water Frame Directive (WFD). The requirements of the most important European Union legislation on water management, the Water Framework Directive (WFD) has to implement every EU Member State. The WFD main objective is to reach the “good ecological” status in every surface and groundwater. According to the Water Framework Directive, the “good status” means not only the purity of water, but also the most undistributed condition of water bound habitats and the appropriate amount of water. The objective of “good status” is to achieve good chemical status of watercourses, stagnant waters, good ecological status in surface waters and ground waters.

In the framework of WFD during the Hungarian river basin management planning phase the following activities were implemented: delimitation of surface waters (rivers, lakes) ground waters (groundwater, stratified water, thermal water); exploring the negative impacts (sources of pollution, other interventions) which affects the water bodies; definition of goals, proposals, and measures to achieve to good ecological status. Based on the assessment of the effects of surface waters (point / diffuse pollution, riverbed interventions, bathing areas, climate change) the necessary objectives and measures are identified.

In this case it is also especially important to emphasize that the interventions planned in the developments must be coordinated with the measures required to achieve the good ecological status, planned or under implementation of the Water Framework Directive.⁵

⁴ Directive 2000/60/EC – Framework for Community action in the field of water policy

⁵ Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007

The 83/2014. (III.14.) Governmental Decree provides for the preparation of riverbed management plans. Operation and maintenance the flood riverbeds requires coordination of several objectives. The content of the target system is determined by the role of the properties of the river in the life and future of society. According that the main goal for the affected population, the river not causing for the unacceptable life and property risk, the river remains a natural habitat, be a part of the landscape and be a source to meet the material and social needs of society.

The flood riverbed must be suitable for its natural hydrological role that is, to ensure the capacity for the flood, ice, and sediments, moreover it must be suitable for the development of native organisms in the landscape and the human use of water and shores.

Within all this, the main task of the riverbed management plans is to establish the flood protection regulations necessary for the management. The former goals should be supported by correlation with other management plans and regulations. The link between the river basin management plans and the river basin management plans mentioned above should also be emphasized here, and its compliance with, for example, the Governmental Decree 178/2010 (V.13.) on the identification of areas affected by the risk of excess water, the preparation and content of hazard and risk maps and risk management plans. ⁶

The planned flood protection interventions both reduce flood exposure and contribute to ensure the safety flood capacity causing least possible flood damages.

Introducing the flood event and flood protection activities in 2020

In the period between 12 October and 15 October 2020, due to a Mediterranean cyclone, 94,8 mm of precipitation fell in the Hernád river basin, 103,1 mm in the Sajó river basin and 90,8 mm in the Bódva river basin.

⁶ 83/2014. (III.14.) Governmental Decree - on the use and utilization of flood riverbed, the river bank zone, the watercourse, the rules on the procedure and content of the preparation of the riverbed management plan

Due to the significant amount of precipitation, rapid water level rises occurred in Sajó, Bódva and Hernád, contained in the legislation in force ⁷ III. Flood protection alert was taken in place.

On October 13, 2020, within the framework of the Local Protection Committee meeting of the North-Hungarian Water Directorate (ÉMVIZIG), the Borsod-Abaúj-Zemplén County Disaster Management Director agreed with the Representative of the Borsod-Abaúj-Zemplén County on the flood and local water damage situation. For the expected hydrological events in the Sajó-Hernád-Bódva river valley have been notified to affected municipalities, constructors and mining companies. The Borsod-Abaúj-Zemplén County Road Operator was informed that roads which are situated in the river valleys could be flooded.

Due to the formation of flood waves in the Sajó, Hernád, Bódva and Tarna rivers, the Water Directorate ordered I. Flood protection alert on all flood protection sections on 13 October 2020 from 2 pm. As a result of further water level rises along the Sajó river from 6 pm II. Flood protection alert and from 10 pm III. Flood protection alert was ordered. On the Hernád flood protection sections II. flood protection alert was ordered on 14 October 2020 from 6 pm and III. flood protection alert was ordered from 10 pm. On the affected flood protection sections the III. Flood protection alert was in force until 19 October 2020 10 am.

The North-Hungarian Water Directorate was maintaining 24-hour observing service on flood protection structures corresponding the current flood protection alert in order to handle the possible flood phenomena. Flood protection sections were regularly crawled and controlled. It applied as a task the drainage water from the flood protection dyke crest, registering water levels, closing and controlling sluices. Contacting with relevant partner bodies and the municipalities was continuous.

The Hungarian Armed Forces was also involved in the flood protection activity in 2010. Helicopters were used to transport the big-bag sandbags to the flood protection site, took part in building temporary flood protection structures and evacuation of Felsőzsolca. (Figure 1.)

⁷ 10/1997. (VII. 17.) KHVM Governmental Decree - Regulation on the protection of flood and excess water



Figure 1: Involvement of Hungarian Armed Forces into the flood protection in 2010,
Source: The Hungarian General Directorate of Water Management

The Water Directorate fulfilled the technical assistance needs of the municipalities without delay.

The operation area of North-Hungarian Water Directorate there are 77,7 km length flood protection dyke along the Sajó River, 62 km length flood protection dyke along Hernád River which are operated by the Water Directorate. During the 2010 flood event 1 settlement had municipal flood protection dyke along the Sajó River. After the 2010 flood event there were built municipal flood protection dykes in 6 settlements along the Sajó River. The total length of new dykes is 22,1 km. In addition of the flood protection dykes, a 4550 m length flood spillway canal. These new structures providing of Miskolc and Felsőzsolca settlements flood protection.

During the 2010 flood event 7 settlements had municipal flood protection dykes along the Hernád River. After the 2010 flood event there were built municipal flood protection dykes for the new flood design water level in 6 settlements along the Hernád River, full length of the new dyke is 10,6 km.

The Bódva River is exclusively state-owned water course, which is operated by the North-Hungarian Water Directorate. During the 2010 flood event there was a flood protection landfill which performs flood

protection tasks. Contiguous flood protection landfills were built on both riverbank along the Bódva from estuary to Edelény, interior area in Szendrő, between Komjáti and Hídvégardó intermittently. After the 2010 flood event there were significant flood development took in place. 3 flood-peak reduction reservoirs were built in Bódvalenke, Bódvarákó and Bódvaszilas. 4 more flood-peak reduction reservoirs built with 5 million m³ capacity in Hídvégardó, Bódvaszilas, Edelény and Szendrőlád. These reservoirs reducing the flood peak water level by the part of the flood discharge temporarily removed from riverbed and inundated these designated reservoir areas.

It should definitely be mentioned a ministerial decision is required that opening these flood-peak reduction reservoirs. The big problem is that the time advantage is exceptionally low due the intense water regime and the proximity of country border.

On 15 October 2020 the North-Hungarian Water Directorate started to build the temporary heightening of flood protection dyke in Gesztely dike-keeper section between 8+000 and 9+800 sections. The building was finished on 17 October 2020. To ensure the flood protection activities the dyke crest was covered and stabilized by crushed stone. The temporary heightening was built to protect the Belegrád drinking water base.

On the Slovakian Hernád River section between Abaújnádasd and Hernádszadány there was a dyke failure on 15 October 2020 and the Water Directorate contacted with Slovakian Water Directorate (Kosice). The outflowing water inundated only agricultural areas. This dike rupture was happened the upper Hernád River section which has no any continuous dykes. There is regular flooding in this area during periods of high water levels. The flooding conveyance in the Hungarian side was not adversely affected.

The Water Directorate reported that a huge floating debris hang up on the Sajószentpéter bridge pillar on 15 October 2020. The floating debris was decreasing significantly the flood conveyance in the bridge river section. The Directorate took care removing of debris from the bridge section.

On 17 October 2020 near the Vadász creek section 1+500 km, the flood protection landfill needed to temporary heightening on the right bank 50 m length. The necessary dyke heightening works were prepared by the Water Directorate.

On 18 October 2020 the Water Directorate detected a seepage flood phenomena on the 08.08. Flood protection section and belegrád dike-keeper section the right side flood protection dike on Hernád River between 2+480 and 2+520 km. The phenomena did not require any intervention, but was observed. The flow of water through the bridge river section under the railway line and the inundation process was closely monitored between the municipalities of Bócs and Hernádnémeti, which did not endanger the inhabited part of the settlement. The Bélus-creek water level was backwatered by the flood wave coming on the Hernád River. The Bélus-stream riverbed was silted and needed dredging work. The dredging work was carried out on the Bélus-stream the sections between 1+000-1+750 km.

On 21 October 2020 on the operational area of the North-Hungarian Water Directorate there were no III. Flood protection alert in place along any watercourses and rivers and no further flood protection tasks required national coordination. The operation of the National Hungarian Technical Coordination Committee has finished on 21 October 2020 12:00. Further flood protection tasks were carried out by own competence of the Water Directorates.⁸

Comparison of the 2010 and 2020 flood event on Sajó-Hernád-Bódva

In the Sajó, Hernád and Bodva river valleys, the last time an extraordinary flood wave was seen was in 2010. During the 2010 flood event there were flood protection activities carried out on the state owned flood protection dykes and technical assistance was needed for 29 municipalities.

During the 2010 flood event there were 1,1 million sandbags used for the flood protection activities. The costs of the flood protection activities regard only for the Water Directorates were exceeded the 2,15 billion HUF. The cost of the 2020 flood protection costs were only 10 % of 2010 flood protection costs.

⁸ Summary report of Flood protection activity in 2020 on Sajó-Hernád – Hungarian General Directorate of Water management

During the 2010 flood event there were no need for operational flood protection activities and transferring resources from other Water Directorates. The North-Hungarian Water Directorate provided the protection activities by own resources.

There were 1,1 million sandbags used for the flood protection activities. The costs of the flood protection activities regard only for the Water Directorates were exceeded the 2,15 billion HUF. The cost of the 2020 flood protection costs were only 10 % of 2010 flood protection costs. Dike heightening was needed only one place on the state own flood protection dikes: on the Hernád River, between Geszthely and Ócsalános, 9+800-8+000 km sections, to provide the protection of water resource basis of Belegrád.

After the 2010 flood events, building of municipal flood protection dikes, flood-peak reduction reservoirs and storm storages and developments of state-owned flood protection structures the flood safety was increasing significantly. The mentioned flood development contributed the successful flood protection activities in 2020. The responsible organizations (municipalities and Water Directorates) for flood protection activities handled successfully this flood event. The flood protection improvements need to be continued and the inadequate flood protection dikes needed to be built. At the same time, these flood events showed that in proportion to flood developments need changing. It is very important to finish our flood protection developments and in the same time we have to stop the increasing of flood water levels because our developed flood protection dikes will lose their safety. We have to removing barriers from the river bed which participate in the flood conveyance. In Sajószentpéter the water level was close to the highest measured water level despite the fact there was the flood discharge was 30 % lower than in 2010. This is clearly points to harmful river bed barrages which is dangerous and needs to be removed.

Summary – future tasks

In the next decade the flood protection developments needed to be focused to the riverbed which participate in the flood conveyance in order to stop the increasing of flood levels and provide to more space for floods. The Sajó-Hernád valley and the Tisza estuary sections will be a pilot area for the new operation of river bed management. There are already some designated riverbed management sample areas

where it was possible to increase both the flood drainage capacity and the ecological values and biodiversity of the landscape. Developments must be planned on a scientific basis that, in addition to ensure the flood safety, increase the attractiveness, livability and nature conservation values of the landscape.

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