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## THE NECESSITY OF THE RIVERBED MANAGEMENT TREATMENT IN THE MIRROR OF THE INTRODUCTION OF THE DIFFERENTIATED FLOOD-PREVENTION

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### **Abstract**

*By using flood hazard and risk maps based on the EU Floods Directive, we can approach the needs of future improvements by examining changes from the flood protected area side. A change of attitude is expected on this issue as we are no longer approaching the flood protection strategy from the resistance side, but from the impact side, namely the flood protected area side risk reduction. This way the same flood protected area side risk can be realized. The method of calculating the resulting differentiated flood levels shows a significant change compared to the previous practice. In order for the new flood levels not to rise, it is essential to maintain the flood capacity of the riverbed. This will prevent our developments so far from losing their value.*

**Keywords:** EU Floods Directive, flood, differentiated flood level, climate change, flood protection

### **Absztrakt**

Az EU Árvízi Irányelve alapján elkészített árvízi veszély-, és kockázati térképek felhasználásával a jövőbeli fejlesztések szükségességét meg tudjuk közelíteni a mentett oldal felőli változások vizsgálatával. Szemléletváltás várható ebben a témában, mivel már nem az ellenállás oldalról közelítjük meg az árvízvédelmi stratégiát, hanem a hatás oldalról, nevezetesen a mentett oldali kockázat csökkenés oldaláról. Így valószínűsíthető meg az azonos mentett oldali kockázat. A létrejövő differenciált árvízszintek számítási metódusában jelentős változás látszik az eddigi gyakorlathoz képest. Az új árvízszintek stagnálásához feltétlenül szükséges a nagyvízi meder vízszállító képességének fenntartása.

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Ezzel elkerülhető az, hogy az eddigi fejlesztéseink elveszítsék értéküket.

**Kulcsszavak:** EU Árvízi Irányelv, árvíz, differenciált árvízvédelmi szint, klímaváltozás, árvízvédelem

## Introduction - the necessity of the regulation

The flood capacity of the rivers came into the spotlight as a result of the flood period beginning in 1998, especially after the Tarpa dike rupture in 2001, when the government initiated a paradigm shift with starting the Vásárhelyi Plan Development (VTT). The scientific responses to rising flood levels clearly show that it caused by decreasing of flood capacity and narrowing of riverbed on the floodplain area.

There are 21 207 km<sup>2</sup> area (almost a quarter of the whole country) in Hungary which is protected against floods. The Hungarian regulation allows the utilization of the periodically flooded areas, which make up approximately 4% of the country (floodplain), at your own risk. At the same time the regulation prohibits building constructions in these areas and changing cultivation is bounded by a rule insomuch that there is no compensation for flood damage. Nevertheless, the field farming, grassland management and fruit production in well-kept soil (e.g., walnut) were gave up as well as the grazing livestock farming in very large areas between the flood protection dykes and unprotected floodplains. By declaring large areas flood protected due the treatment limitation the invasive undergrowth vegetation is growing which cause low flow velocity and sediment accumulating which accelerate the filling of riverbed.

The settlements were getting closer and closer to the rivers; the resorts which built on legs originally as prescribed were slowly built-up, the plots were surrounded by fences. This led to the flood levels increased by more than one meter on average in Hungary.

The flood protection dykes which built in the second half of the 20th century; its cost exceeds thousand billion forints and lost their original function the flood safety can no longer be guaranteed today. If the mention process cannot be prevented there is no chance of controlling the rise in flood levels and our ongoing flood protection projects will be lose their function within 20-30 years.

## **The modern riverbed management plans – „Room for the rivers” – conditions and tools**

The planning of Vásárhelyi Plan Development (VTT) began in 2001-2002 showed that "area affected by flood" are generally known to everyone, but this was not designated in a legally relevant way in the real estate register. In 2004 the riverbed definition concept and its statutory requirement were defined. The fact of location in the riverbed should have been recorded. In the absence of implementing provisions the initiated proceeding was stopped.

The legal conditions or application of modern riverbed management are laid down in Act LVII of 1995 on water management. Act 2011/2013 related to making water damage prevention more effective, then Act 83/2014. (III.14.) Governmental Decree.

The content of the riverbed management plans - coupled with advanced engineering and design tools - already follows the principle that there should be no total ban in the riverbed area but select 4 different flow zones according to its role in the flood capacity and flow. This allows for a reasonable differentiation of constraints. This is consistency with legitimate ownership claims that areas have never been flooded – e.g., “islands” topping from the riverbed - or protected by simple and temporary tools not classified into the riverbed or at least loaded with a lesser restriction. In areas that have a valid municipal water damage management plan, and the Municipalities declares to prevent flooding, in that case, the area may be excluded from the involvement of riverbed. The area where the final flood protection structures built from municipal or state sources and by this the risk of flooding is eliminated; in that case as well the area may be excluded from the involvement of riverbed. In areas that are heavily involved in flood capacity or water transport, stricter standards and more consistent compliance is a basic obligation. The possibility of 4-zones differentiation is shown by the example of buildings in the floodplain (figure 1.):

- I. The primary flow zone is the riverbed itself or the open area next to the riverbed which carries extremely large amount of water during a flood. In this flow zone the construction and renovation of a structure not directly related to water use is prohibited.
- II. The secondary flow zone is still carries significant discharge where the renovation of an existing building is eligible, but an increase in the floor area of the building is not permitted.

- III. The temporary flow zone is a periodically flooded area, it still involves in the flood drainage, but the role is not significant. In these areas it is possible to expand the buildings, and also building is eligible with special permit.
- IV. In the dead flow zone anything can be built if the owner tolerates the flooding.<sup>2</sup>



*Figure 1. 4 zones of riverbed management plans*

The municipalities are urging the registration of riverbed as a legal entity because their planned developments can be started in the knowledge of this. Due the registration, the owner is not entitled to compensation, because the registration does not create stricter conditions than the current licensing procedures. The licensing procedure alleviates it by differentiating. On the other hand, the registration establishes a technical fact which has been confirmed by the recent floods.

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<sup>2</sup> 83/2014. (III.14.) kormányrendelet (governmental decree)

## **The importance of the riverbed management in the introduction of the differentiated flood-prevention**

The definition of the flood designed water level (Hungarian acronym: MÁSZ)<sup>3</sup> is a result of a decision taken on the basis of certain technical and economic considerations. It basically depends on the financial possibilities and the technical development at the given time. The main goal is to taking account the specific carrying capacity of the country within the foreseeable future; the flood protection structures should provide the greatest safety for the flood protected areas.<sup>4</sup>

Based on the water management development strategy before 2000 in order to ensure the flood safety, building dykes were the basis for the development of the protection system. After 2000, the adaptation to climate change became increasingly important, in that time started to development of flood control reservoirs along the Tisza River. In 2015, in order to preserve the flood-defence capability, the riverbed management plans were completed. The riverbed management plans contain the implementation plans to reduce to rate of increasing flood levels.

After 2020 is the one of the main sectoral strategic objectives in the field of flood protection is the introduction of differentiated flood-prevention which is based on the risk of the protected side. Differentiation is still possible to a small extent in the current 74/2014. (XII. 23.) Ministerial Decree, however, this is not flexible enough compared to Hungary's current load-bearing capacity.

The biggest problem with the current system is that as a result of natural processes and human interventions, the flood design water levels (MÁSZ) have increased significantly compared to previous levels. The economic situation of the country does not allow that the flood protection system to be built to the required level (declared in Ministerial Decree 74/2014 XII. 23.) in the foreseeable future.

Introduction of the differentiated flood-prevention can be a solution which was appeared as a national flood risk management alternative during the preparation of the flood risk management plan. The aim of the version evaluation on the risk management target area selection

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<sup>3</sup> 74/2014. (XII. 23.) belügyminiszteri rendelet (Ministerial Decree)

<sup>4</sup> Országos Vízügyi Hivatal (National Water Office), 1987.

the optimal version from the alternatives of implementations. The selection criteria for the variant assessment correspond to the requests in the target area of risk management, land-using.

The previous flood protection development strategies were based primarily on technical and technical-social needs and then, adaptation to climate change was increasingly the main direction. Introduction of the differentiated flood-prevention provide opportunity to an opportunity to accelerate the development of flood safety based primarily on the country's economic load-bearing capacity.

The Flood Directive the treatment of the inundation from abundance of waters takes place in risk funds in EU level. The concept includes the transition from risk-based practice to risk management in the formulation of safety standards. The concept also includes the followings: adaptation to existing hazards when using flood risk areas, the principle of balanced and differentiated security and the transition from defensive disaster management to prevention.

Second cycle of implementation of the Flood Directive named in "Preliminary flood risk assessment, hazard and risk maps, first review of flood risk management plans" is an ongoing KEHOP project. The aim of the project is to develop the risk-based differentiated flood protection standards. The basis for differentiation is essentially of economic origin.

During the economics calculations we have to follow the principle of the highest level of safety in the shortest possible time. It is proposed to introduce an interstitial level of protection with a minimum value equal to the current flood designed water level (MÁSZ) calculated without safety height. The interstitial level is the level taken on the basis of socio-economic opportunities, differentiated on the basis of a given risk value.

On those areas proposed to introduce the differentiated interstitial flood water level where it prevails the following:

- In the short term - within an EU financial cycle – no flood protection development or investment.
- With taking into account the protection time advantage, the local lead of flood protection undertakes that prepare for an interim flood water level, that can be protected the area with great safety.

Advantages of introducing a differentiated interim level of protection:

- With the new level of developments, a significantly larger part of the risky flood protection sections can be made defensible.
- The flood safety can be increased nationwide in a short time.

## Summary

Differentiated flood-prevention development can only be economical with the introduction of riverbed management, because it can stop further increases in flood levels. In case of lack of the mentioned development we can count increasing flood levels; the protected flood protection dyke sections will be exposed and risky again.

In summary, it can be stated that the current legislation seeks to develop flood protection. In Hungary, the flood safety regulations are milder than stricter than the international average, so the further mitigation in flood safety is not appropriate. However, the achievement of the required flood protection, due the increasing flood water levels and the lengths of flood protection dykes, the construction for proper flood protection structures would significantly burden the Hungarian economy.

In order to increase the flood safety more quickly, it is important to introduce an interim level especially where the height of the flood protection does not even reach the flood design water level. With this method, by raising the critically low sections to a protectable level, the defenceless sections can be eliminated faster, because the defensibility can be established at a lower cost, on a longer section than the complete protection.

In those sections where the conditions for protection have already been established, the new developments can only be allowed for the level of protection. The condition for the above is the introduction of riverbed management which is handle that the flood levels do not raise further at this rate.

## References

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