

# 10<sup>th</sup> Anniversary of the Parallel Flood Control on the Danube and Tisza Rivers in Hungary in 2006

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*The paper wants to present the work done during the management of major floods and inland waters in Hungary ten years ago, in the year of 2006, to safeguard the population, and the measures taken during the protection activities. It was very important for everybody who had responsibility for the operational control of the response to disasters and emergencies in Hungary (floods, inland waters, extreme weather conditions, to simply say: the range of natural and man-made disasters), especially for the population living along the Danube and Tisza Rivers.*

**Keywords:** river, flood control, inland water, geographical features, parallel flooding, inundations, disaster management, water management experts, dump, dyke, sandbag

## The Precedence of Floods and Inland Waters in Hungary were as Follows

The purpose of the paper is to present an overview on the efforts made during parallel flood control on the rivers Danube and Tisza in 2006, from ten years' perspective. [1] At the beginning, it is worth clarifying what the specialist literature means by the concepts of flood and flood control.

Flood: the temporary covering by water of land not normally covered by water. [2]

Flood control: preparing for and organizing protection against floods and any other activities related to protection carried out after the flood wave recedes. [3]

Due to Hungary's relief and drainage features, frequent inundations endangered large and high-value areas. The catchment areas of Hungary's rivers are in the high mountains of the Alps and Carpathians mainly outside the territory of our country.

According to statistics, minor or moderate flooding can be expected every 2–3 years, major flooding every 5–6 years and extreme flooding every 10–12 years. The duration of major flood waves on the upper sections is 5–10 days, while on the middle to lower sections it can be as long as 50–120 days. Based on the extent of flood plains, Hungary "boasts" the highest level of flood vulnerability in Europe.

Due to the climate and geographical features of Hungary and the surrounding regions, flood effects may occur on any of the rivers, anytime of the year.

The 21,000 square kilometers flood area in the valleys of the Danube and Tisza Rivers is protected by 4220 kilometers long flood control embankments. One third of the country's arable land is found here. One quarter of Hungary's population lives in the 700 settlements of the flood area.

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Due to the geographical features of Hungary, mountain reservoirs are not available to withhold water, as they are located outside the country. Our rivers on the Great Plain run with a slight descent, therefore they had to undergo regulation such as cutting through the bends and building dams and dykes.

One of the most common methods of flood control is to prevent spreading of water by establishing flood control embankments. They are the primary ways to protect national economic values. The 4200 kilometers long flood control embankments mentioned earlier also belong to this category, so they bear high significance.

Natural disasters, including river and groundwater flooding belong to natural events. If we take a look at their history, it is clear that they have been part of humanity's history since ancient times and the future is expected to be no different. Moreover, their impacts might be even more damaging and destructive as a result of global climate change.

Floods have played a large part in society, the extent of the part depending on the extent they endanger or destroy human lives, health, material and cultural goods and affect agricultural activities.

Effective flood control can prevent significant losses. For instance, in 2001 in the region of Bereg, the dam on the River Tisza collapsed by the settlement of Tarpa due to the extreme flood. The losses suffered were worth over 100 billion HUF.

In order to protect the population, settlements, agricultural and industrial establishments, a coherent and effective flood control system was called for against the destructive effects of floods.

In line with our national legislation and the professional requirements, our methods for flood control can be divided into two main groups: a) structures, b) non-structures.

The tasks of flood control are laid down in paragraph 16 of The Water Management Act [4] as follows: protection against the destructive effects of floods, including building, developing and maintaining embankments is the responsibility of the state, local governments and those interested in preventing and mitigating losses. The Visegrád Four countries are members of the EU. In the interest of its members, EU has reviewed the situation of flood control and issued the Water Framework Directive (2000/60/EC), which sets the framework for the community action in the field of water policy. The Directive was adopted in Hungary in 2003–2004. Therefore, Hungary's flood control is in line with EU recommendations.

## **Inland Waters**

The considerable amount of precipitation since the autumn of 2005 has raised the amount of water resources in the ground by 95 percent. The large amount of snow and the continuous rainfalls greatly contributed to the inland inundations in large parts of the country.

Due to the continuous worsening of the inland water situation, the size of the flooded areas grew to 224 hectares and the number of evacuees exceeded 220 persons, the number of vulnerable buildings was 1100 and the number of vulnerable population reached 3200 persons. (As a comparison, in 2000, 2860 persons, in 2001, 12,886 persons and in 2002, 2021 persons were evacuated. In 1999, the inundated areas reached 380,000 hectares in Hungary)

The affected ministries and national authorities, furthermore the county disaster management directorates prepared themselves for the response to floods and inland waters. The notification, call-in and activation plans at the counties, the aggregated evacuation and reception

plans, the emergency supplies accommodation possibilities, the aggregated emergency plans and the databases of equipment used during flood and inland water response were updated.

The majority of the directorates created the possibility of accommodating the population from the vulnerable areas at the reception settlements in a very short time by updating the availability of the designated facilities.

Besides the flood and inland Water management efforts, another problem was that due to high ground water, in several settlements a ban on funerals had to be ordered.

The flood control activities were carried out under the direction of water management experts, by the county disaster management directorates and the municipalities conjointly, using the material stocks available. The number of responders was 1200–1500 persons daily, in average.

Parallel with the inland water control, flood management activities had to be started as well. This is unusual because in general the situation is reverse.

## Flood

The parallel flooding of the Danube and Tisza Rivers is very rare, it only happens every 50–60 years. Hungary's two main rivers, during the spring flood in 2006, broke the highest water level records in the past 100 years, simultaneously endangering the population and the traffic in the flooded areas.

On 30<sup>th</sup> March assets and work force had to be gradually regrouped from the inland control activities to the Danube River in North Western Hungary to carry out flood control works. Exhausting flood control efforts were made at Győr and in the region of the Danube Bend and Budapest. Due to the sudden rise of water level of the Tisza River, flood control activities had to be started in the upper section of the river. The most critical situation evolved in the regions of Tokaj and Szolnok.

A declaration of emergency was made at 1500 hours on 3<sup>rd</sup> April (by Government Decree 76/2006. (IV. 3.) on the Komárom-Tass section of the Danube River, and on the section of the Ipoly River between Ipolytölgyes and its mouth. The revoking of the emergency took place at 1500 hours on April by Government Decree 85/2006. (IV. 10.).

A significant problem was caused by the fact that the flood wave on the Danube was caught up by the one on the Tisza River, and the water streams, which had slowed down, caused high water levels for several weeks in Hungary. Therefore, exhausting efforts were made at the same time along both major rivers.

The declaration of flood emergency for the Tisza River was made at 1300 hours on 14<sup>th</sup> April (by Governmental Decree 87/2006. (IV. 14.), on the Tisza River from Kisköre to the state border, on the entire Hungarian section, of Maros River, on the Hármas-Körös River from Mezőtúr to its mouth, and on the mouth section of the Zagyva River.

At 1700 hours, on 18<sup>th</sup> April on both banks of the Hármas-Körös River, including the section to the mouth of the mouth of Kettős-Körös River, the emergency was extended.

Besides the activity of the central unit of the flood control, the National Technical Direction Staff, the Operational Staff and Emergency Center of the Governmental Coordination Committee, operating at the headquarters of National Directorate General for Disaster Management (NDGDM), continuously carried out flood and inland water management tasks.

The county protection committees periodically assessed the situation and took measures for implementing the most necessary tasks.

Protection committees, county disaster management directorates, their civil protection branches and mayors paid much attention to public information and the code of conduct even at the onset of emergency situations. [5: 113]

Flood protection preparedness was valid on approximately 2200 kilometers, the number of participants in the flood control efforts was 20,000–25,000 persons daily, during which approximately 10 million sandbags were used to reinforce the protection structures.

Due to the slip and cracks on the dykes in the region of Szelevény, on the Hármas-Körös River, in order to guarantee the safety of population of Tiszasas and Csépa villages, the Chairman of the Protection Committee of Jász-Nagykun-Szolnok County, by issuing his decree 7/2006. (IV. 23.) ordered full evacuation in Szelevény, and partial evacuation from the areas in Csépa, and Tiszasas lying lower than +86 meters measured from the level of Baltic Sea.

During the flood and inland water protection activities 2500 persons were evacuated. Out of this number 280 persons had to be evacuated because of the flood wave on the Danube. Out of this number 230 persons were evacuated because of the inland waters.

The number of settlements performing flood and inland flood control activities has reached 350: a) 200 flood control, b) 150 inland water control activities. Extraordinary flood control preparedness was ordered in 79 settlements.

Under the guidance of water management experts, besides the population of affected settlements, manual worker squads from civil protection organizations, disaster management and fire service personnel, and soldiers from the Hungarian Defence Forces participated with their special equipment. Even if forces and equipment were sufficient during the management today it could be more professional by using new technologies. [6]

The flood wave on the Danube River left Hungary on 24<sup>th</sup> April and at the same time reconstruction began.

## **Lessons Learnt during Inland Water and Flood Control Activities**

In Hungary, the availability of dykes is satisfactory. It meets the requirements of highest expected water levels. However, the protection structures are incapable of holding high water levels for a longer duration of time (2–3 weeks). Therefore, the technical conditions of the dykes have to be regularly controlled and the various flood effects necessitate the continuous attention of all the participants.

The successful involvement of Hungarian Defense Forces, and civil protection organization was the guarantee of the well organized and disciplined implementation of tasks. They can be easily mobilised and have rearrangeable equipment (amphibious, aviation and pontoon). Therefore, their personnel can be deployed even in such places where other, non-military forces cannot.

The use of civil protection organizations had a very awkward start, since the Public Labor Program, announced by the Government, covered the same people as designated duties. We have overcome this problem, and at Szolnok and Szeged, the civil protection organizations helped the flood control efforts with 7000 persons.

Disaster tourism meant a great problem for the experts directing the flood protection activities in large cities (Budapest, Szeged and Szolnok). This kind of problem was also mentioned at the floods of Borsod County, which happened in 2010. [7] Other restrictive measures were the limitation of the use of airspace, navigation ban, speed limits for rail and public transport.

*Positive sides were:*

- there is a well-functioning emergency management system (line ministries, the bodies of Governmental Coordination Committee, protection committees of counties, experts with experience from the previous exercises in emergency management);
- availability of initial protection stocks and equipment at the most vulnerable settlements, thus making the immediate response possible;
- the Government responded in due time and declared emergency and allocated the necessary resources to manage the floods;
- the protection was directed by experienced water management experts, the regrouping went on in an organized way between the Danube and the Tisza Rivers, the same applied to National Directorate General for Disaster Management with the civil protection and fire service personnel;
- the reinforcement of the protection structures slipped because of the continuous water load in a conjoint way (civil protection, fire, Hungarian Defense Forces, water management experts, voluntary non-governmental organizations [NGO's], etc.) was possible because of the well-organized local direction;
- the evacuation of settlements vulnerable to inundation (population, livestock, tangibles, hazardous wastes, etc.) was accomplished based on the plans made and continuously updated by disaster management organ;
- the Government made significant efforts to help the people living in the areas stricken by floods and inland waters, request for international assistance was made through European Union Monitoring Information Centre (EU MIC), we received offers from Austria, Romania, Slovenia and Sweden;
- the activity of civil protection experts helping the municipalities greatly contributed to the successful flood control and the coordinated activity of organizations participating in the protection efforts: county disaster management directorates and water management directorates;
- besides managing our own emergencies we were helping the countries of the region (Romania, Serbia and Bulgaria, requested on 25<sup>th</sup> April). Our helping was very necessary for Serbia, because in the region of Vajdaság a lot of dams of rivers were destroyed from floods.

## **Status of Cooperation**

Early 2006, the floods in Central Eastern Europe directed the attention to the necessity of international cooperation between the different countries.

In order to accomplish a wide range of cooperation it is expedient to attach importance to:

- mutual assistance;
- implementation of joint flood protection projects and tenders;
- establishment of Flood Emergency Response Unit in each country, their use in each other's countries, if necessary;
- elaboration of uniform protection guidelines and statutes;
- establishment of professional contacts with the organizations of foreign countries involved in emergency management;
- building joint monitoring systems;
- harmonization of databases;

- joint training of experts participating in flood protection;
- expansion of cooperation into other fields of disaster management (fire, nuclear emergency management, cross border transportation of hazardous materials, the management of the consequences of major industrial accidents, etc.).

## Conclusions

In conclusion, it can be stated that parallel flood control on our two major rivers Danube and Tisza in 2006 was highly effective. State control was successfully conducted, water and disaster management bodies together with other state organizations, voluntary NGOs, local governments and the affected population did their best to protect embankments.

Even at the 10<sup>th</sup> anniversary, the success of flood control in Hungary is highly remarkable, since floods claimed no human casualties in Hungary. Dams proved to be reliable and they persisted, except for the dam collapse in Tarpa in 2001, and the floods in Borsod in 2010.

Hungary welcomes suggestions from other countries and the lessons learnt during the flood control activities from neighboring countries, the VISEGRAD 4, in order to enhance our own organizational and flood control system.

Based on experience of the past years, the government intends to strengthen prevention, so the National Directorate General for Disaster Management (NDGDM) has recently taken over water management authority tasks related to licensing and supervising, [8] while the organizations in charge of actual flood control, that is, the Hungarian General Directorate and the Directorates of Water Management are subordinate to the Ministry of Interior. The Parliament passed the new Disaster Management Act [9] in 2011, coming into force on 1<sup>st</sup> January, 2012. The newly introduced tasks are intended to ensure an even higher level of protection to the population and material goods in flood situations.

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