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## EXTREME WEATHER PHENOMENA, IMPROVEMENT OF PREPAREDNESS

### *Absztrakt/Abstract*

*A globális felmelegedés okozta klímaváltozás, az elmúlt években egyre jobban érzékeltette hatását hazánkban is. Gyakorivá váltak a szélsőséges időjárási jelenségek, a viharos szél, az özvízszerű esőzés, a hóviharak, az extrém hőmérsékletingadozások. Sajnos ezek a hirtelen időjárás-változások nem minden esetben jelezhetők előre, ezért a védekezésre nehéz felkészülni.*

*Szerzőink a hazánk szempontjából kockázatot jelentő időjárási jelenségeket mutatják be cikkükben, kutatásaikkal, tapasztalataikkal is segítve a preventív tevékenységet és a felkészülést.*

*Some changes in climate caused by the so called “global warming” have become more and more perceptible even in our country in the past few years. Extreme weather phenomena happen more often, such as windstorms, heavy rainfalls and snow-storms or rapid temperature fluctuations. Unfortunately these sudden changes in the weather are not always predictable, so preparing for defense is difficult.*

*The authors of this paper describe the weather phenomena that can cause risks in our country helping the preventive activities and the preparedness with their research findings and experiences.*

**Kulcsszavak/Keywords:** *globális klímaváltozás, szélsőséges időjárási jelenségek, özvívízszerű eső, szélvihar, hőség, extrém hideg, hóvihar ~ global climate change, extreme weather phenomena, heavy rainfall, windstorm, heat, extreme cold, snow-storm*

## INTRODUCTION

Due to geographical circumstances and environmental abilities of Hungary the disaster risks of the country consist of many determinant natural sources. The territory of Hungary lies between 45°45' and 48°35' of northern latitudes, almost halfway between the Equator and the North Pole, geographically in the Northern Temperate Zone. Its weather is very changeable. The main cause of this changeability is that Hungary is situated in the coincidence of three great climatic areas: the arid continental with extreme temperatures, the smooth, mild and rainy oceanic and the Mediterranean with hot and dry summers and mild and rainy winters. Any of the three climate types can rule the weather of our country for some time making the forecast difficult and causing big differences within the borders despite the small territory and the almost plane surface.

The other determinant of our climate is the relief of the surface. As the country lies at the very bottom of the Carpathian Basin (on more than the half of it are planes below 200 m of elevation and ratio of zones with more than 400 m of elevation is less than 2 percent) effect of the Carpathian Mountains has to be emphasized. Our country also places in halfway between the Atlantic Ocean and the middle of the Eurasian Continent. In summer, 60-70 percent of the winds are of oceanic origins, but wintertime continental winds are the dominants. Sometimes winds blow towards southwest showing Atlantic Ocean origin but sometimes towards northeast with Mediterranean impact. However our country is in the belt of the western winds (surrounded with the Alps and the Carpathians) and the ruling wind is the northwestern, southern winds have a secondary maximum here.

If we take a general picture, we can say that our country is in the moderately warm and arid continental climatic area. It is true for the majority of the Great Plains and for the Small Plains, but the lower part of the Danube and Körös-Maros Close are warmer and more arid while the Nyírség moderately cool and arid and the Szatmári Plain is moderately cool and humid. The moderately warm/arid and warm/humid climate areas are typical in the Southern Transdanubia, while moderately cool/arid and cool/humid in the Western Transdanubia. In the upper regions of our mountains cool, moderately arid and cool, moderately humid areas can be found. The cool and humid climate can be found only in the Kőszegi Mountain [1].

If we make an overview on the climate of Hungary, it is clear that heavy rainfalls, windstorms, extreme hot or cold temperatures and extraordinary amount of snow all can cause risks as extreme weather phenomena. These phenomena caused a lot of damages in our country recently, and the elimination of their consequences were difficult, complex engineering rescue tasks [2]. Analyzing the latest disaster situations caused by these extreme weather phenomena and relief activities to eliminate their consequences, we can say that these events occur more intensively and more frequently causing emerging danger, so we would like to help the preparedness works with basic information concerning each type of phenomenon and the relief activities with useful, practical advices.

Unfortunately we can not anticipate disaster situations with extreme meteorological origin, but we still have to focus on prevention, as this is the key to rapid, effective complex disaster relief and also helps to ease the damages.

In most cases disaster relief carried out by professional units and organizations (e.g. fire brigades) with their own equipment, but sometimes this is not enough, so help is the personal responsibility of all citizens [3].

## KEY FEATURES OF EXTREME WEATHER PHENOMENA AND STEPS OF PREPAREDNESS FOR DEFENSE

### Heavy rainfalls

Among the extreme weather phenomena, heavy rainfalls unfortunately not always predictable, so adequate preparedness is very important, damages can be eased by regular maintenance of water drainage systems. Recently some of our settlements suffered from heavy rainfalls repeatedly, so we developed the following steps for preparedness based on practical experiences of damage clean-up activities.

Main feature of a heavy rainfall is that extreme amount of precipitation falls in a very short time (within minutes) that the water drainage system can not derive properly, so in most cases water is accumulating in populated areas as inland water. In general, drainage of this accumulated water can be done by channeling and pumping, but sometimes in serious situations protection with sandbags also could be necessary. If the water accumulated outside the settlement, it should be stopped with channeling to avert water from populated areas.

Key steps of preparation:

- Regular checks and maintenance of water drainage channels;
- Connections of building rain-pipes to the sewage system should be inspected by the authorities and illegal connections must be cut off;
- Regular checks and maintenance of technical equipment necessary for defense;
- Provision of sand necessary for defense;
- Check and maintenance of the register of necessary vehicles and tools;
- Check and actualization of the register of local disaster management organizations.

### Windstorms

Windstorms are predictable in most cases, so the population must be informed about the preventive measures in order to minimize damages. There were heavy windstorms in our country in the past few years, so we tried to elaborate experiences coming from these damage clean-ups.

Wind speed categories can be seen in the following table:

WIND CATEGORY	WIND SPEED	
	m/s	km/h
Calm	0	0
Light breeze	1-3	4-11
Moderate breeze	4-7	15-25
Fresh breeze	8-11	29-40
<b>High wind</b>	<b>12-16</b>	<b>43-58</b>
<b>Gale, strong gale</b>	<b>17-24</b>	<b>61-86</b>
<b>Violent storm</b>	<b>25-32</b>	<b>90-115</b>
<b>Hurricane force</b>	<b>33-</b>	<b>119-</b>

**Table 1.** Wind speed categories [4] [5] (assembled by the authors).

Main feature of a windstorm that it acts in a short period of time throwing trees down, breaking limbs down, bursting roofs of buildings open, damaging electric and communication wires and causing accidents on roads and railways. In most cases, relief activities are done by

professional fire brigades but there is also an important role of the population in order to minimize damages.

Key steps of preparation:

- Regular checks of the reports of Hungarian Meteorological Service;
- Regular checks and maintenance of windows, shutters and persiennes on the buildings;
- Information of the citizens about weather forecast in case of wind category “high wind” and upwards (see Table 1.), attract their attention to close and lock their doors and windows properly and move to safe places in time before the windstorm, warn them about the risks on leaving their houses or shelters, and order them to behave with extra caution during transportation;
- Prevention of unwanted situations;
- Regular checks and maintenance of technical equipment necessary for defense;
- Check and maintenance of the register of necessary tools and transportation vehicles;

## Heat

In the Green Paper on Critical Infrastructure, published on 24<sup>th</sup> November 2005, the European Commission addressed key issues such as against what threats the European Programme for Critical Infrastructure Protection should protect, the definition of what is EU critical infrastructure and what is national critical infrastructure and the role of owners and operators of infrastructure. The Green Paper” along with many other issues, requests attention on the health risks of extreme heat [6]. So it has a paramount importance to develop a proper action program for the protection of the population in case of heat alarms.

The population of our country contains a lot of highly endangered (sensitive) groups whose members can stay in open air continuously or for a long time during heat waves. Officials should pay extra attention in organizing outdoor sport events and similar programs for the masses to be able to handle health risks in case of extreme hot weather. Protection of workers in open places is also highly important in these circumstances. Providing appropriate health care includes extra water supply, cover against direct sunlight, and also proper working dresses.

From environmental and medical point of view those economic and communal services have priority that during heat waves can positively affect not only the quality of the environment but the living conditions of the population.

Drinking water resources, water well systems, water purification facilities and water pipelines together have to be highly protected that water authorities can provide fresh water for the population in adequate quantity and quality. If high daily temperatures last for longer time, water consumption can dramatically raise and resources simultaneously fall, so management of water services for both the public corporations and the civilians would become more and more difficult.

In our country, electric companies can provide services for all customers even in longer periods of extreme heat with a maximum daily interruption of 2-3 hours. Because Hungary is a transit country, so we can not regret risks of transportation in extreme hot weather. Railway networks, highways and roads all can be risk sources.

Even smaller breakdowns can cause serious consequences in railway transportation. These can be deformations in rails, damages in electric wires and suspension towers because of the heat. If railway transportation stops temporarily, there is large number of passengers that should be supplied on stations or even on the trains on open lines until they can carry on their travel.

There can also be accidents on highways and roads with heavy traffic and traffic jams can easily occur. On summer days with higher temperatures the number of road accidents is generally much higher than the average. In case of traffic jams, accident sites can be difficult to reach for rescue units. In these situations, in case of extreme heat a large number of people should be supplied e.g. with water even if then unharmed.

Bus lines of mass transportation companies are continuously active even in the hottest weather situation. Newer versions of vehicles are already equipped with air conditioners, but there are a lot of older ones in service, where cooling can be provided only with the opening of windows and generating some fresh air intake with ventilation to protect passengers against the heat.

In case of extreme hot weather, regular pick-up of communal waste is also important to avoid infections and nasty smells.

Heat waves are predictable in most cases, so the population must be informed about the preventive measures in order to avoid health damages.

Key steps of preparation:

- Regular checks of the reports of Hungarian Meteorological Service and information of National Public Health and Medical Officer Service;
- Informing the population, raising their attention on the importance of more water intake, to stay in cover from direct sunlight, the risks on leaving their houses and order them to behave with extra caution during transportation;
- Information must be gathered about the elder, the seriously ill or in any other way endangered citizens;
- Fresh water resources must be ready to mobilize;
- Fresh water transportation vehicles must be ready to deploy;
- Street washer vehicles must be used as necessary;
- Information must be gathered about the settlement's air conditioned installations which suitable for accepting masses of citizens.

### **Extreme cold and snowfalls**

Heavy snowfalls are predictable in most cases, so the population must be informed about the preventive measures in order to keeping good health and to minimize damages. Main feature of a snowfall that it acts in a certain period of time and if comes with extreme cold, it can damage electric and communication wires, can disturb long-range heat and drinking water distribution systems and can cause accidents and malfunctions on roads and railways. In most cases, efficiency of relief activities can be raised with appropriate preparedness.

Key steps of preparation:

- Regular checks of the reports of Hungarian Meteorological Service;
- Information of the citizens about weather forecast in case of predicted heavy snowfall or extreme cold, attract their attention to close and lock their doors and windows properly and move to safe places in time before the blizzard, warn them about the risks on leaving their houses, and order them to behave with extra caution during transportation;
- Involve the local disaster relief organizations into the defense activities;
- Stockpiling anti-skidding materials;
- Check of usefulness and proper maintenance of necessary tools and transportation vehicles;

## CONCLUSIONS

Due to the global change, extreme whether phenomena have become more frequent in Hungary nowadays and the strength of the harmful events are also rising recently. In order to ease damages preparedness is the key issue, but to develop and activate appropriate preventive measures, it is imperative to be familiar with the features of the phenomena. Organization, command and control of relief activities also needs this knowledge.

The authors of this paper picked up this issue, because handling the challenges and consequences of extreme whether phenomena is no doubt an actual and important problem in disaster management. We wanted to raise attention to the organized preventive measures, the necessary involvement of the population and we would like provide the basic check-list to improve defense capabilities.

The complex challenge caused by these extreme whether phenomena of course needs more research, and the next step could be to develop similar “to-do lists” not only for the preparedness, but for the whole period of defense activities from the preventive phase through the on site defense to total rehabilitation.

## References

- [1] [www.met.hu/eghajlat/magyarorszag](http://www.met.hu/eghajlat/magyarorszag) ; downloaded: 25<sup>th</sup> July, 2012.
- [2] Kuti Rajmund: Komplex műszaki mentések tervezésének lehetőségei, védelem online 2010. <http://www.vedelem.hu/letoltes/tanulmany/tan233.pdf>
- [3] Földi László: Impacts of climate change to disaster management tasks with special emphasis on critical infrastructures, Hadmérnök on-line, VI. Évfolyam 3. szám, 50-57. o. [http://www.hadmernok.hu/2011\\_3\\_foldi.pdf](http://www.hadmernok.hu/2011_3_foldi.pdf)
- [4] Péczely György: Éghajlattan, Nemzeti Tankönyvkiadó Budapest, 2006.
- [5] [http://en.wikipedia.org/wiki/Beaufort\\_scale](http://en.wikipedia.org/wiki/Beaufort_scale) , downloaded: 4<sup>th</sup> September, 2012.
- [6] <http://www.euractiv.com/security/critical-infrastructure-links-dossier-188349> downloaded: 5<sup>th</sup> September, 2012.