

Flood Risk Management in the Czech Republic

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Floods in the Czech Republic

Flood categories Winter and spring floods Summer floods Flash floods Ice floods

1784, 1845, 1981, 2000, 2006 1890, 1981, **1997**, 2002, 2010, 2013 1979, 1987, 1996, 1998, 2009 1982, 1985





Relevant floods in recent years

Flood	Type of flood	Stricken area	Return period N-years	Flood effects	
July 1997	summer regional two flood waves	Oder and Morava basins	100 to 500 exceptionally >500	62,6 mld. Kč 50 fatalities	
July 1998	flash flood	Dědina, Bělá (right tributaries of the Orlice)	>100	1,8 mld. Kč 10 fatalities	
March 2000	spring flood, thaw and rain	upper Elbe and Jizera basins	50 to 100 exceptionally >100	3,8 mld. Kč 2 fatalities	
August 2002	summer regional two flood waves	Vltava and Berounka basins, lower Elbe	200 to 1000 someplace >1000	73,1 mld. Kč 17-19 fatalities	
March/April 2006	spring flood, thaw and rain	Dyje, Morava, Sázava, Lužnice and other basins	50 to 100 exceptionally >100	6,2 mld. Kč 9 fatalities	
June/July 2009	flash flood	Nový Jičín., Jeseníky and Děčín regions	100, > 100 someplace >> 100	8,5 mld. Kč 15 fatalities	
May/June 2010	summer regional two flood waves	Oder and Morava basins	50 to 100 exceptionally >100	5,1 mld. Kč 3 fatalities	
August 2010	summer flood with flash flood features	Smědá, Lužická Nisa, Ploučnice and Kamenice	50 to 100, >100 exceptionally >1000	10,1 mld. Kč 5 fatalities	
June 2013	summer regional two flood waves	Vltava and Berounka basins, Elbe and some tributaries	20 to 50 some place >100	15,3 mld. Kč 16 fatalities	

CHMÚ Distribution of floods with top discharge > HQ_{100}





July 1997 flood in Moravia part

The regional flood generated by two heavy regional rainfalls of long duration over Moravia and Silesia and east Bohemia. They caused floods in all rivers in these regions, mainly on the Oder, the Morava and their

tributaries. Return period of peak discharges > 500 years. Catastrophic floods were on the Polish part of the Oder basin as well. Damages and losses:

- 558 municipalities affected by floods
- 2,8 millions inhabitants
- 1250 km2 of flooded area
- 29 000 living houses damaged
- 50 (60) people died
- 62 600 mil. CZK (2 500 mil. EURO) losses







August 2002 flood in Czech part

The regional flood generated by two heavy regional rainfalls with 3 days pause over Bohemia. They caused floods in all rivers in affected regions, mainly in the Vltava and its tributaries. Return period of peak discharges in rivers in South Bohemia > 1000 years. Due to the basin shape, all runoff was concentrated in the Vltava in Prague, with peak 500 years. Catastrophic flood passed along the Elbe to Germany. Damages and losses:

- 986 municipalities affected by floods
- 3,2 millions inhabitants
- 510 km2 of flooded area
- 11 500 living houses damaged
- 17 (19) people died
- 73 140 mil. CZK (2 900 mil. EURO) losses rom that 1/3 was in Prague

















- play great role during flood situations





Flood Risk Management Plans

Planning according to Flood Directive (measures in areas with significant flood risk)

International Flood Risk Management Plans



Areas with significant flood risk (based on PFRA) together 187 areas , 2960 km of water courses

River Basin Management Plans

Planning according to Water Framework Directive (2nd phase – measures in other areas)

International River Basin Management Plans



Flood Protection and Landscape Water Regime

Areas without significant flood risk

Methodology was prepared by Water Research Institute Documentations were processing by River Basin Companies (8/2014) Flood Risk Management Plans will be summarized by Ministry of Environment (10/2014) Plan proposals were consulted with public (1 – 6/2015) National plans will be approved by the Czech Government (12/2015) Reports for the European Commission will be prepared by Water Research Institute (3/2016)

Areas with potential significant flood risk



together 990 municipalities

Aspects of proposed measures in FRM plans

Prevention

- 1.1 Spatial planning stop building in flood risk areas
- 1.2 Removal or relocation of buildings from flood risk areas
- 1.3 Individual resilience of buildings in flood risk areas

Preparation

- 3.1 Improving of flood forecasting and warning
- 3.2 Improving of flood emergency/contingency planning

Protection (structural measures)

- 2.1 Natural catchment and runoff management
- 2.2 Water flow regulation (reservoirs, polders)
- 2.3 Channel and flood plain works (increasing capacity, protective dikes)

	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2
Labe basin	all		all		29	24	all	all
Odra basin	all	4	all		12	12	all	all
Danube basin	all		all	8	12	35	all	all
Celkem	all	4	all	8	53	71	all	all



Flood Protection System in Prague

the 1st phase before 2002 flood, the 2nd – 8th phases (2002 – 2013)

17,5 km of longitudinal structures (dikes, walls, barriers) 6,4 km mobile barriers





2002 flood in Prague center – right river side designed on Q100 water level + 50 cm





2002 flood in Prague center – left river side



Other phases were designed on maximum water level in 2002 flood + 30 cm



Function of flood protection structures Lužnice river in Bechyně

Training in 2012







Reality in June 2013



Historical floods in Prague

Before systematical observation

1118, 1141, 1159, 1250, 1272, 1273, 1310, 1315, 1337, 1342, 1362, 1373, 1392, **1432,** 1445, 1463, 1481, 1496, 1501, 1523, 1537, 1570, 1612, 1613, 1675, 1678, 1712, 1770, 1770, 1771, 1772, **1784**, 1785, 1824 Observed floods in Prague 1825 - till now

1845, 1862, 1872, **1890**, 1940, 1954, 1981, **2002**, **2006**, **2013**





Winter and summer floods in Prague





Significant floods in the past





Flood Danger Levels - > flood response activities



Levels (degrees) of flood danger are declared according to water level in rivers at reporting sites (water gauges). Authorritative water levels for declaration are given by Flood Emergency Plans as well as response activities.

There are 3 categories of reporting sites:

category A – basicthey arecategory B – complementarythey arecategory C – localthey are

they are in the Flood Emergency plan of the Czech Republic they are in Flood Emergency Plans of Regions they are setting by municipalities for their local needs they are in Flood Emergency Plans of Municipalities they are used in Local Warning Systems (rainfall, water level)



Course of June 2013 flood in the VItava Cascade reservoirs



Study on assessment of reservoirs operation on flood regime in variants:

- reference variant (current stage)
- increasing retention volume of Orlík or other reservoirs
- releasing of water from reservoirs before flood
- shortage of necessary preparatory measures in Prague (building mobile barriers)
- using hydrological forecast for operative control

Goals:

- minimize top discharge in Prague
- fully use retention volume of all reservoirs



Orlík Dam on the Vltava River (total volume 716 mil. m³) during August 2002 flood



Orlík Dam on the Vltava River (actual volume 410 mil. m³) in October 2015





Thank you Jan Kubát Czech Hydrometeorological Institute kubat@chmi.cz

Here, I can't be threaten by flood