

**Middle Tisza District Environment and Water
Directorate**



Information tools of flood risk mapping

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Aims

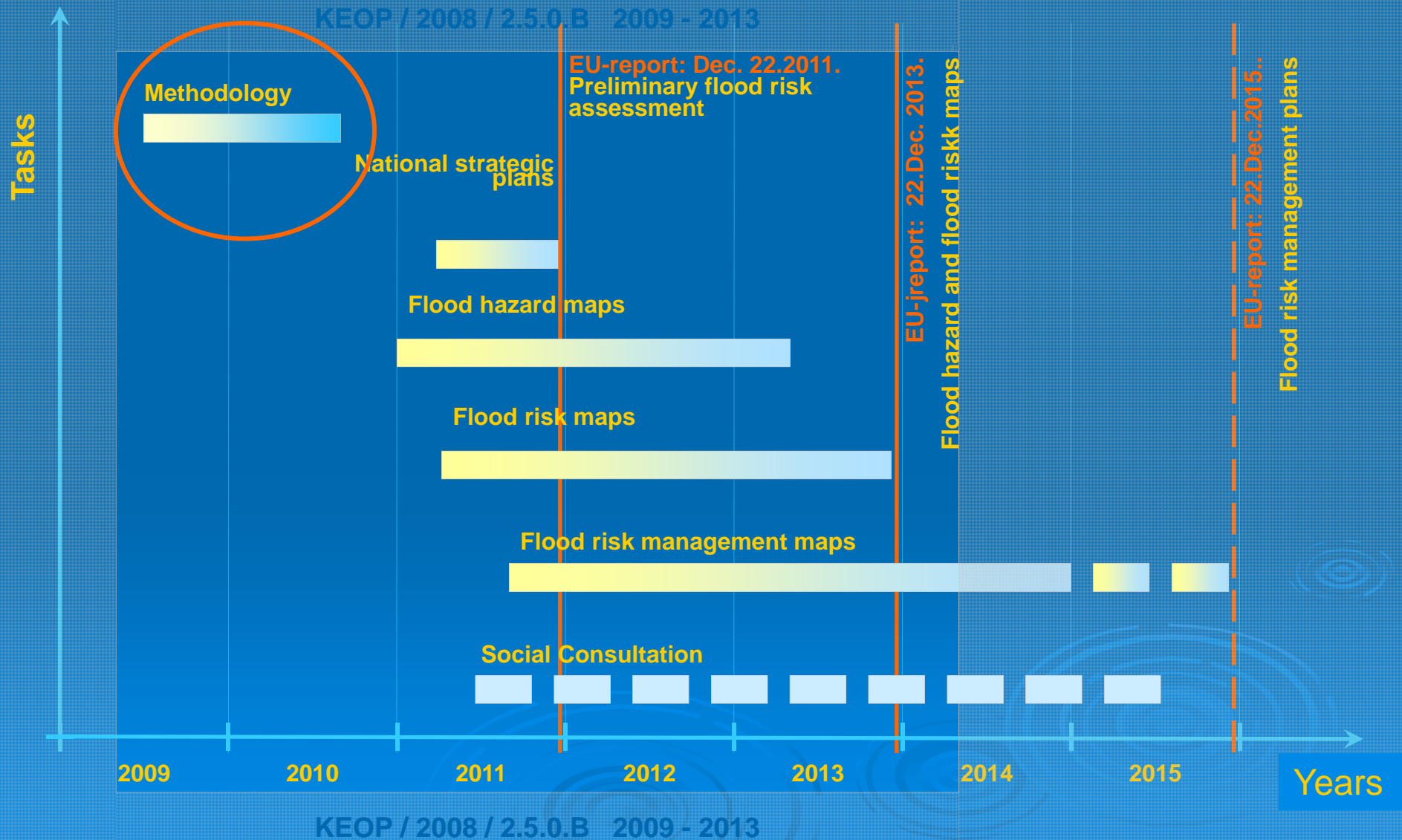
- Fulfilling the European Parliament's and Council's 2007/60/EC "Directive of flood risk assessment and management"
- The Hungarian national flood management strategy's adaptation to the changed social and economical requirements.

Organisation

Consortium of flood risk management:

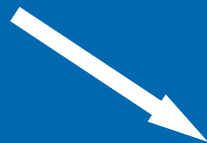
- State Water Directorate
- 12 Environment and Water Directorates

Schedule of planning



Geographical coverage

Overviewing of existing
methodics

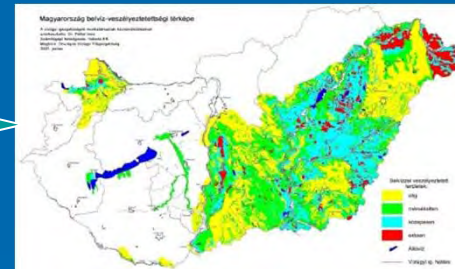


Preliminary regional
coverage

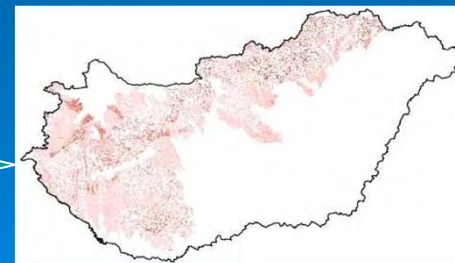
Overviewing of existing
maps



flood
24%

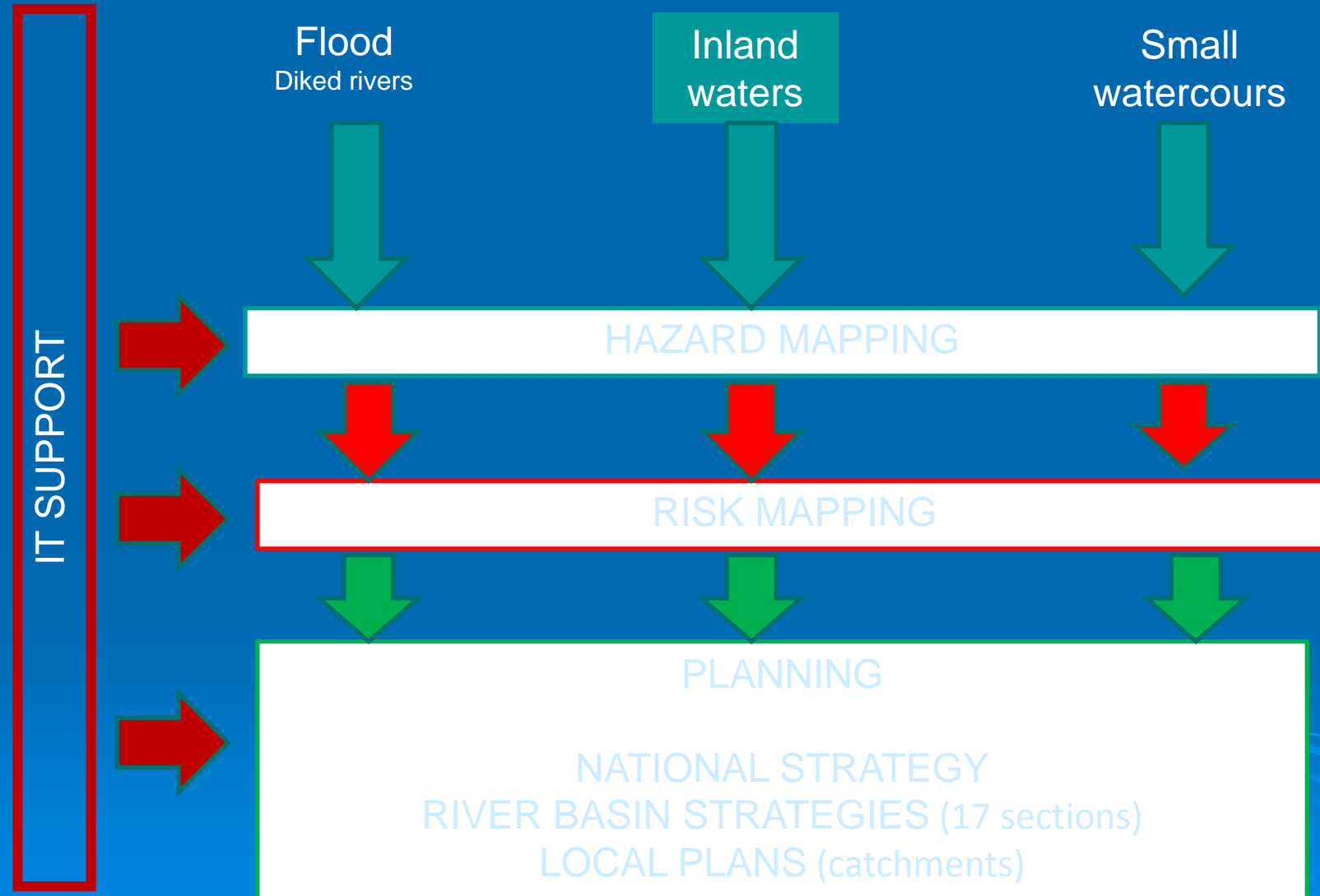


Inland waters
45%



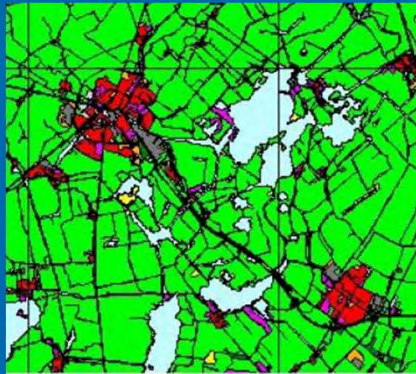
Small
watercourses
45%

Methodological project



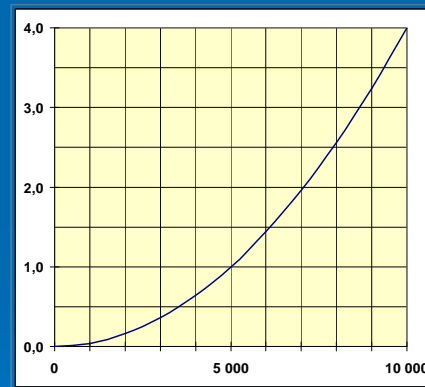
HAZARD and RISK

Usage of
territory



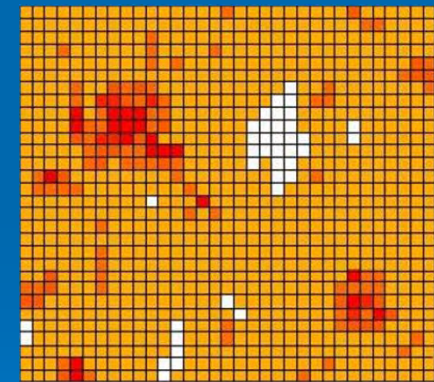
Usage of territory

Effect



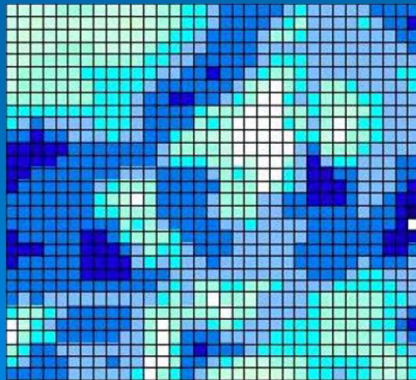
Damage functions

Risk



Damages

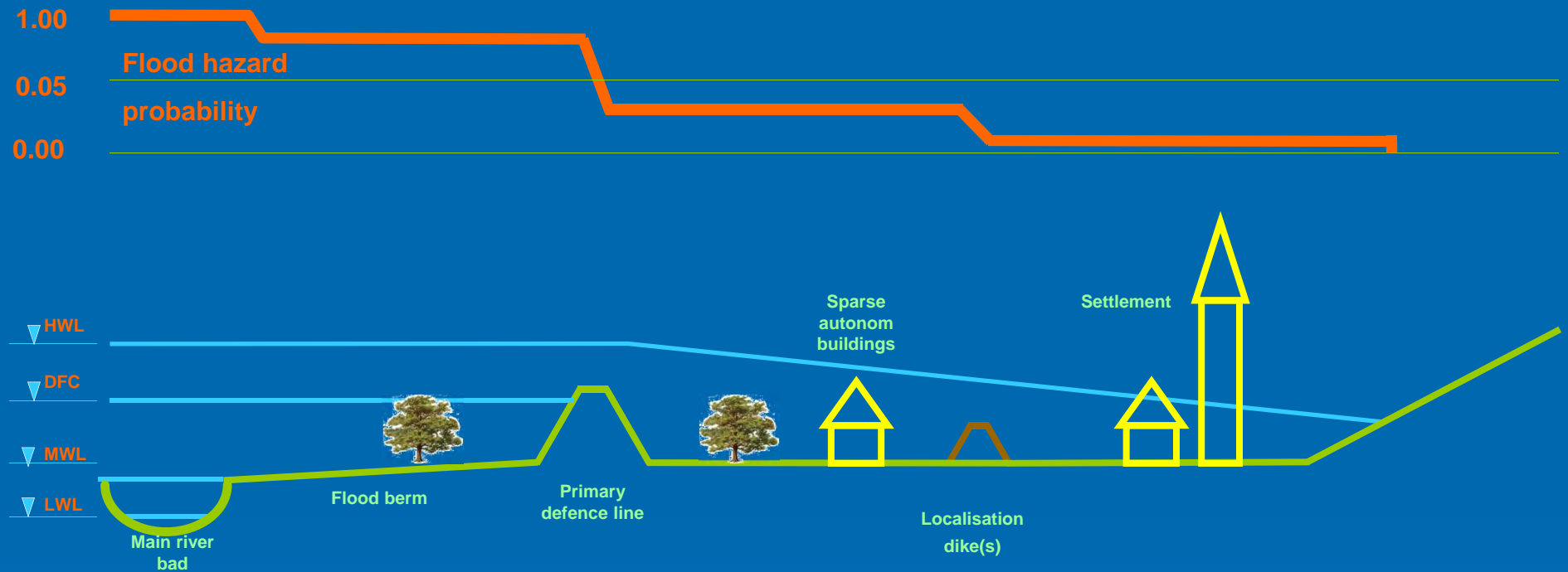
Hazard



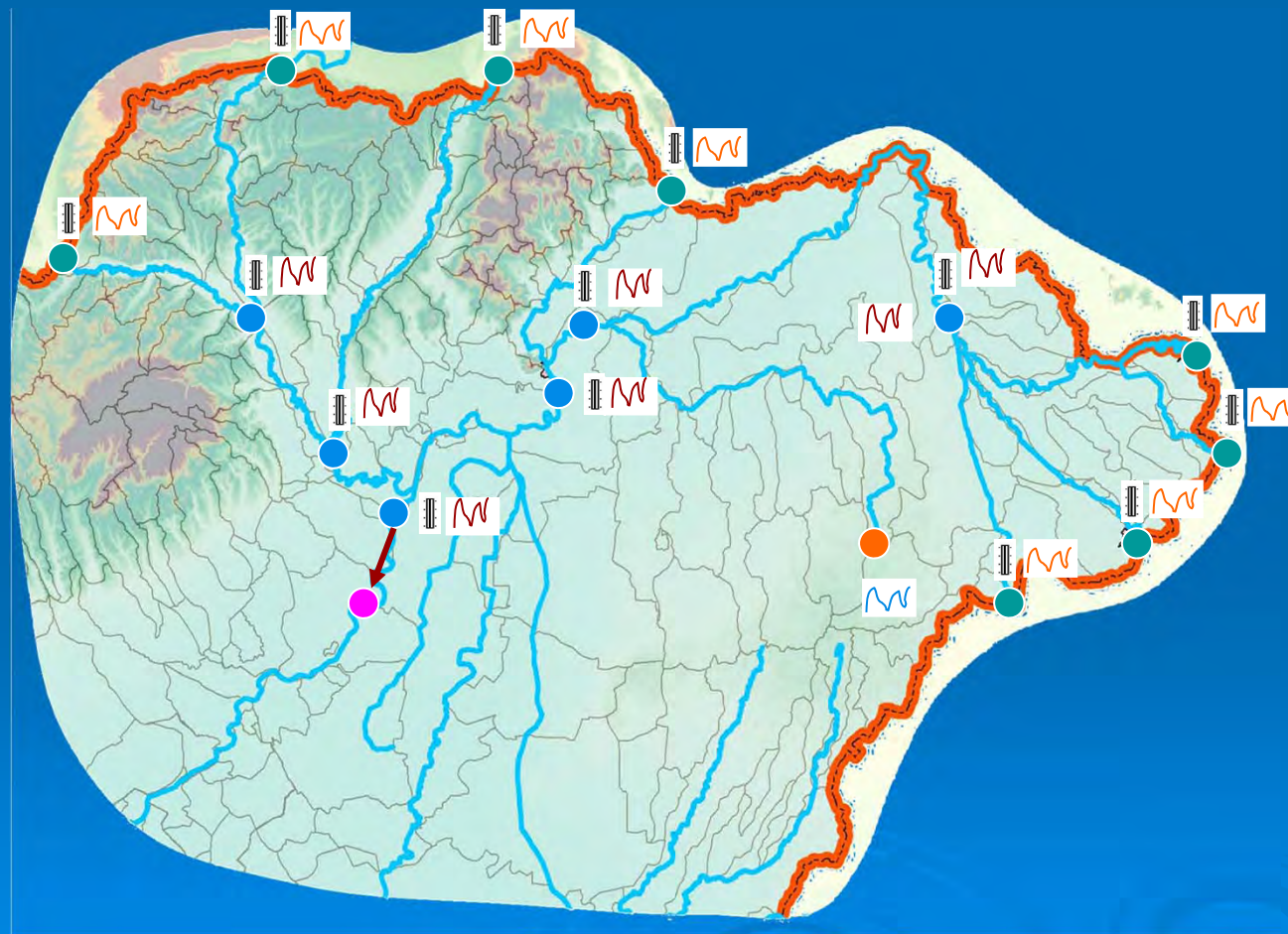
Depths of inundation

Flood hazard and its probability

In case of diked river



Determination of flood wave image



Inspected section

Measured data

Time series to fixed time

Allocation of flood wave image (statistical method)

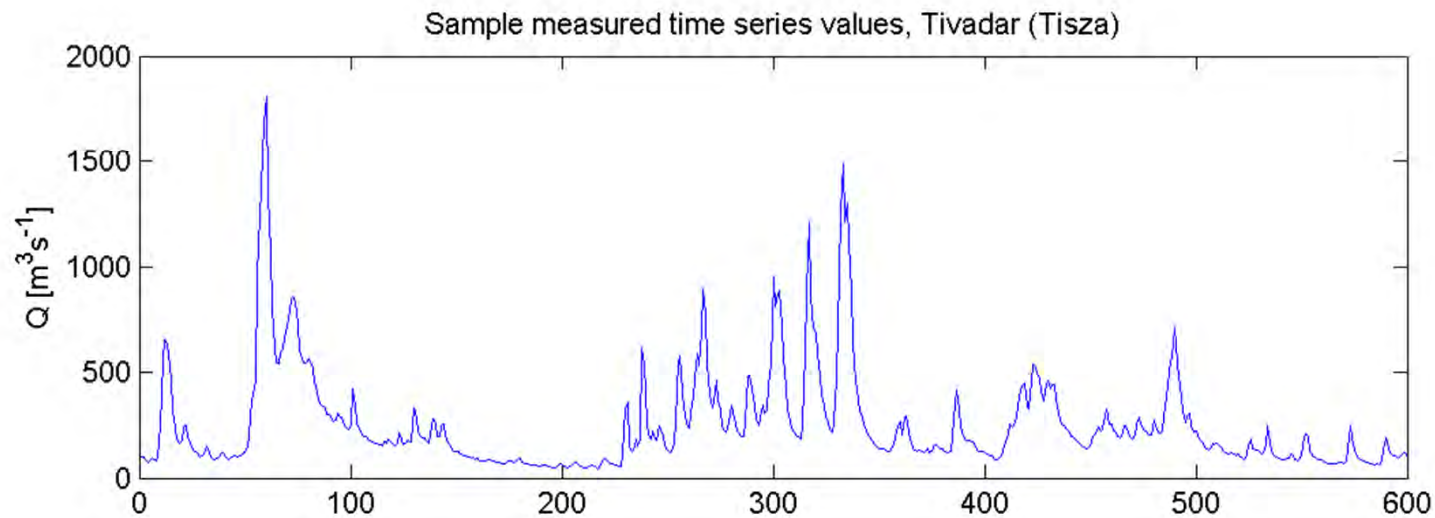
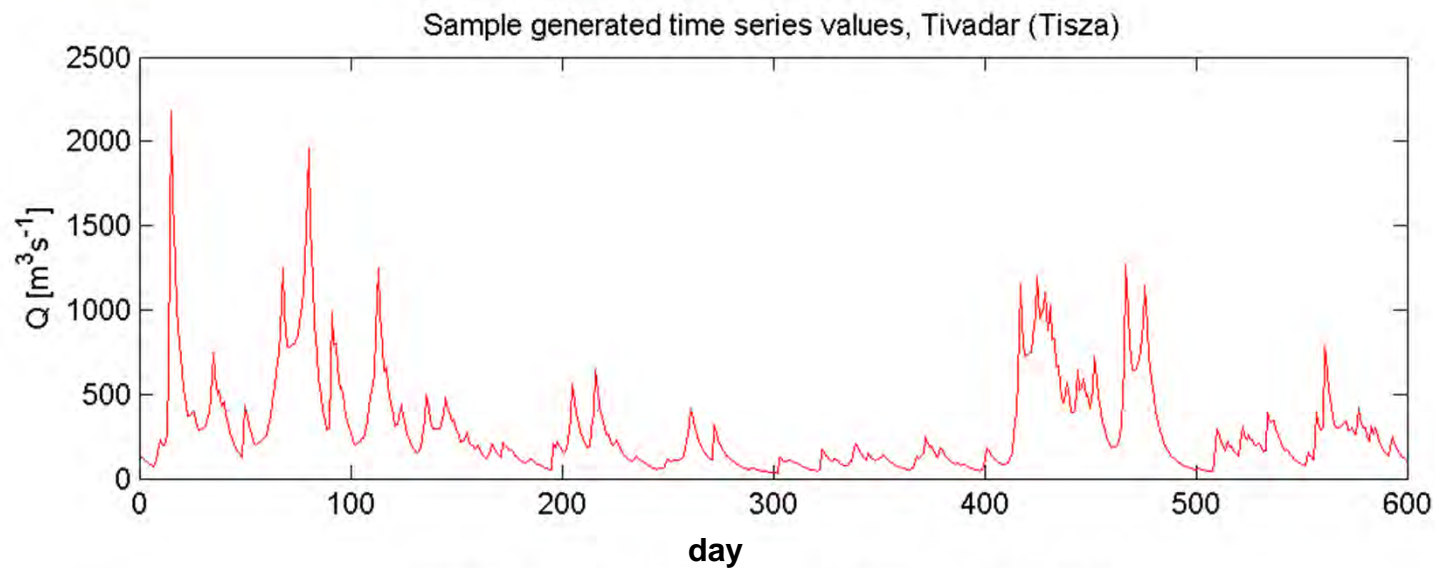
Representative floodwave images 1 D hydraulic transformation to the inspected section

No measured data series

With regional representative context

(Csermák-Kóris methodics)

Generated and measured water volume time series

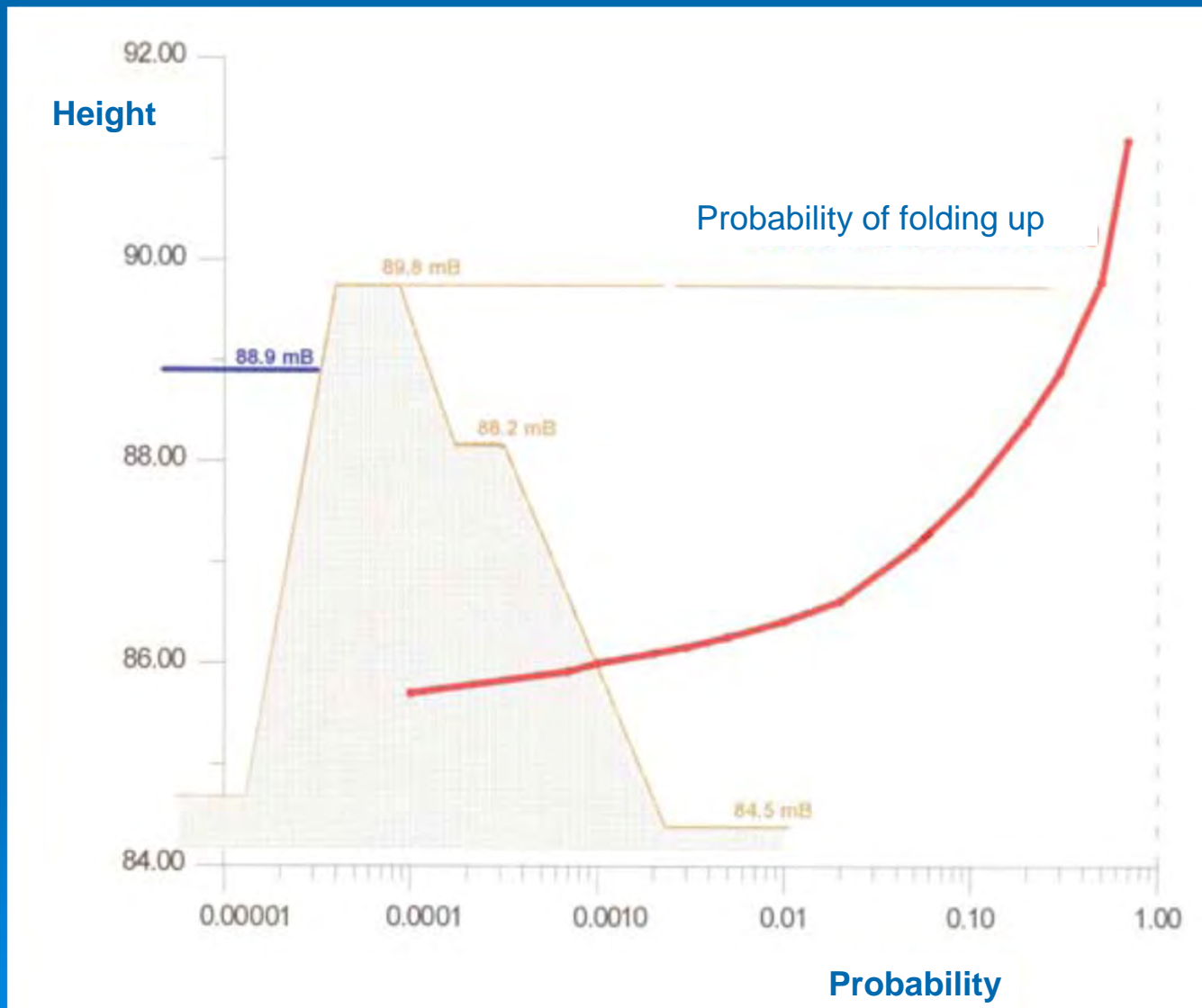


Flood defence lines of Hungary

length of defence lines: 4 220 km



Probability of folding up



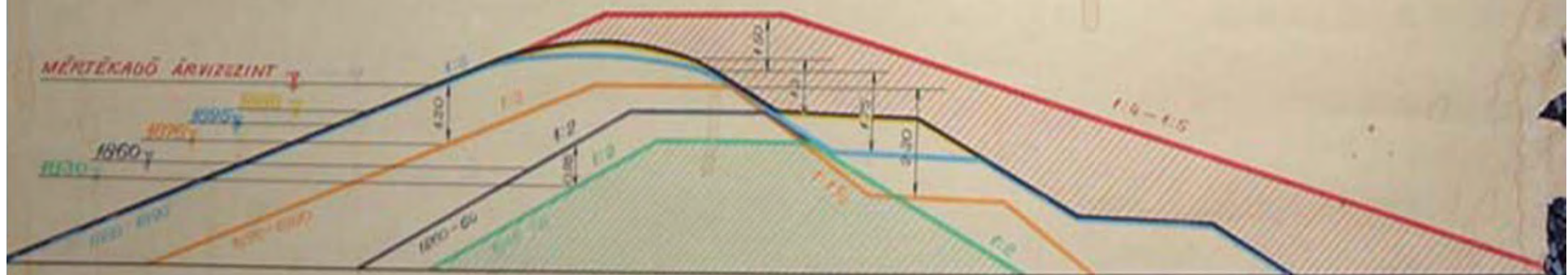
Development of Széchenyi dike

Tiszadob-Polgár

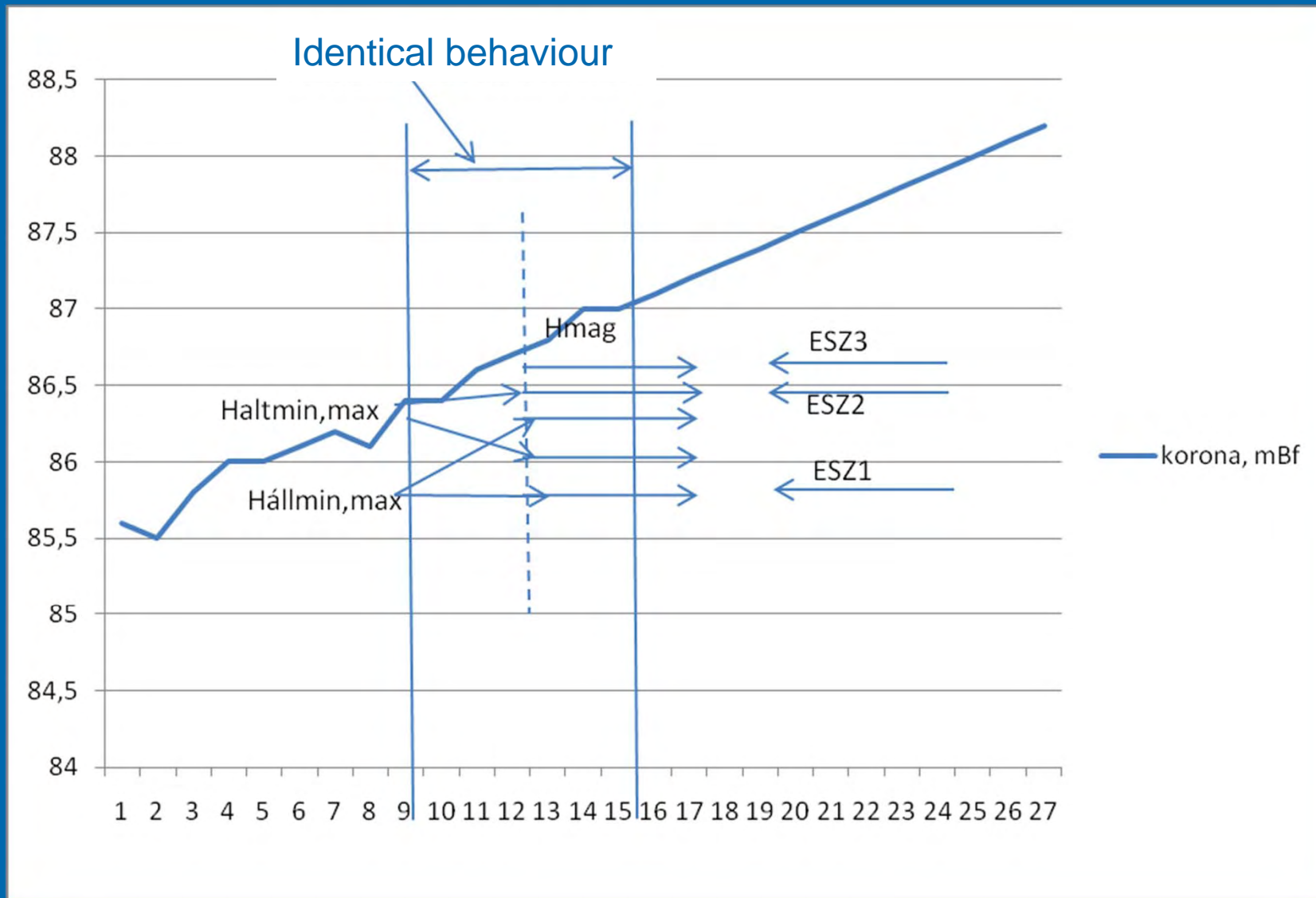
(54+000 — 65+000 SZLV.)

Development of dike size

Year of flood	Height safety	Width of top	Slope	
1830	0.95	284-380	1:3-1:2	1:2
1860	1.26-1.58	3.80	1:2	1:2
1876	1.30	4.00	1:3	1:1½
1888	1.00	6.00	1:3	1:2
1895	1.00	5.00	1:3	1:2
MÉRTÉKADÓ	1.50	5.00	1:4-1:5	1:3



Defence capacity



Main steps of water volume simulation method (summary)

- We have observed the upstream sections of the river system and sub watercourses' entering sections generating time series and random floodwaves.
- Then we calculated the shaping water volume/water level by transformation method.
- Selection of the critical floodwaves regarding the selected eruption, employment of the detailed hydrodinamical model 1D + 2D in the area of the observed section.

Inundation maps

Water depth rasters



Waterspeed rasters

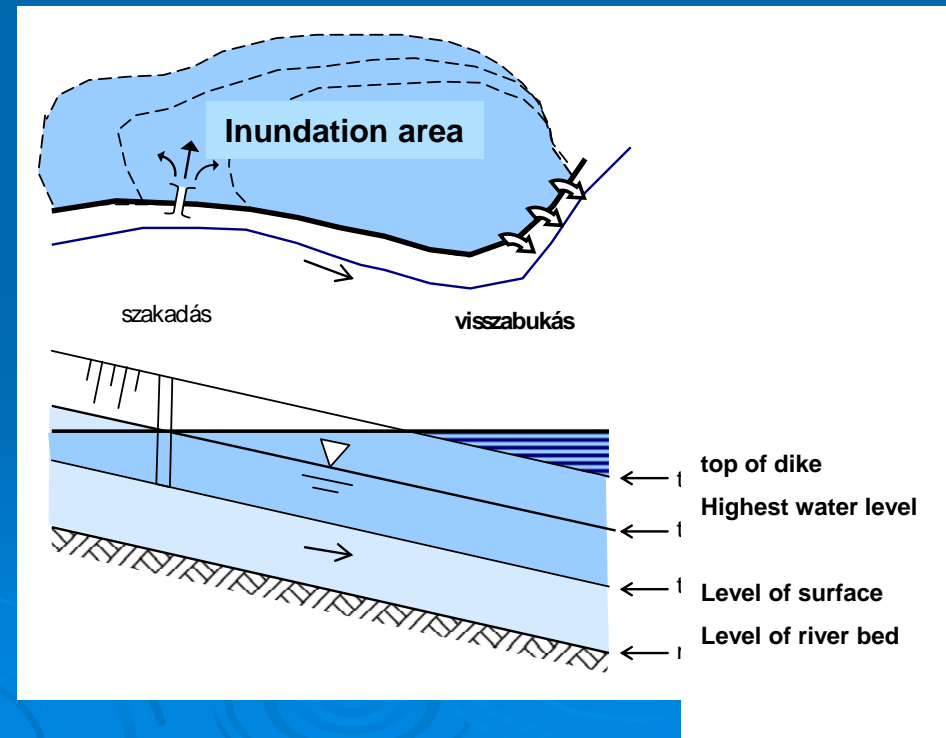
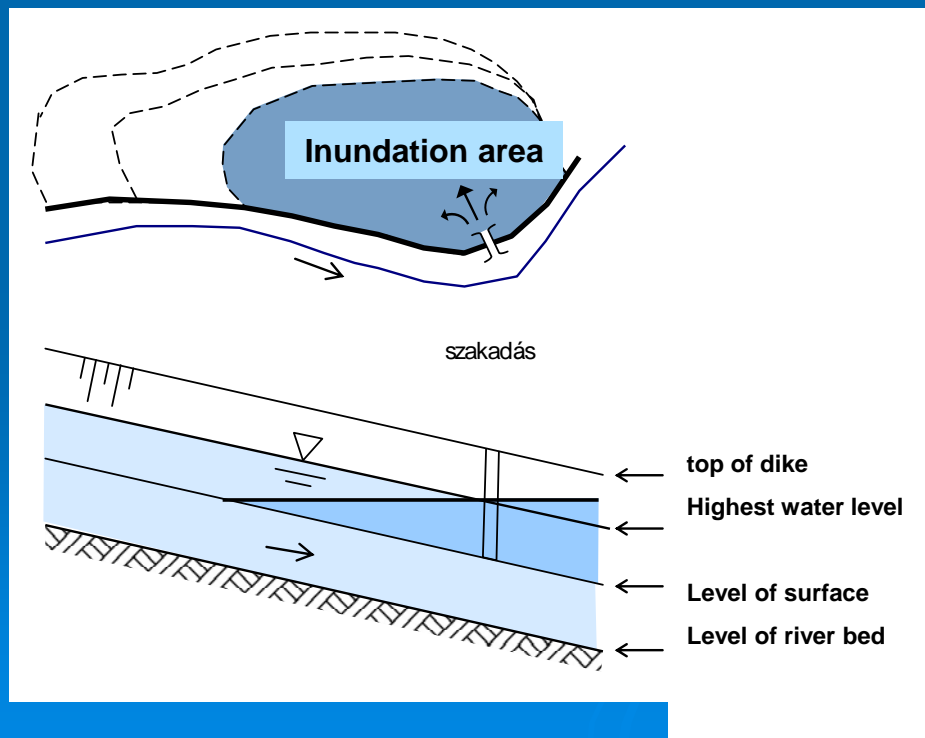


Inundation area



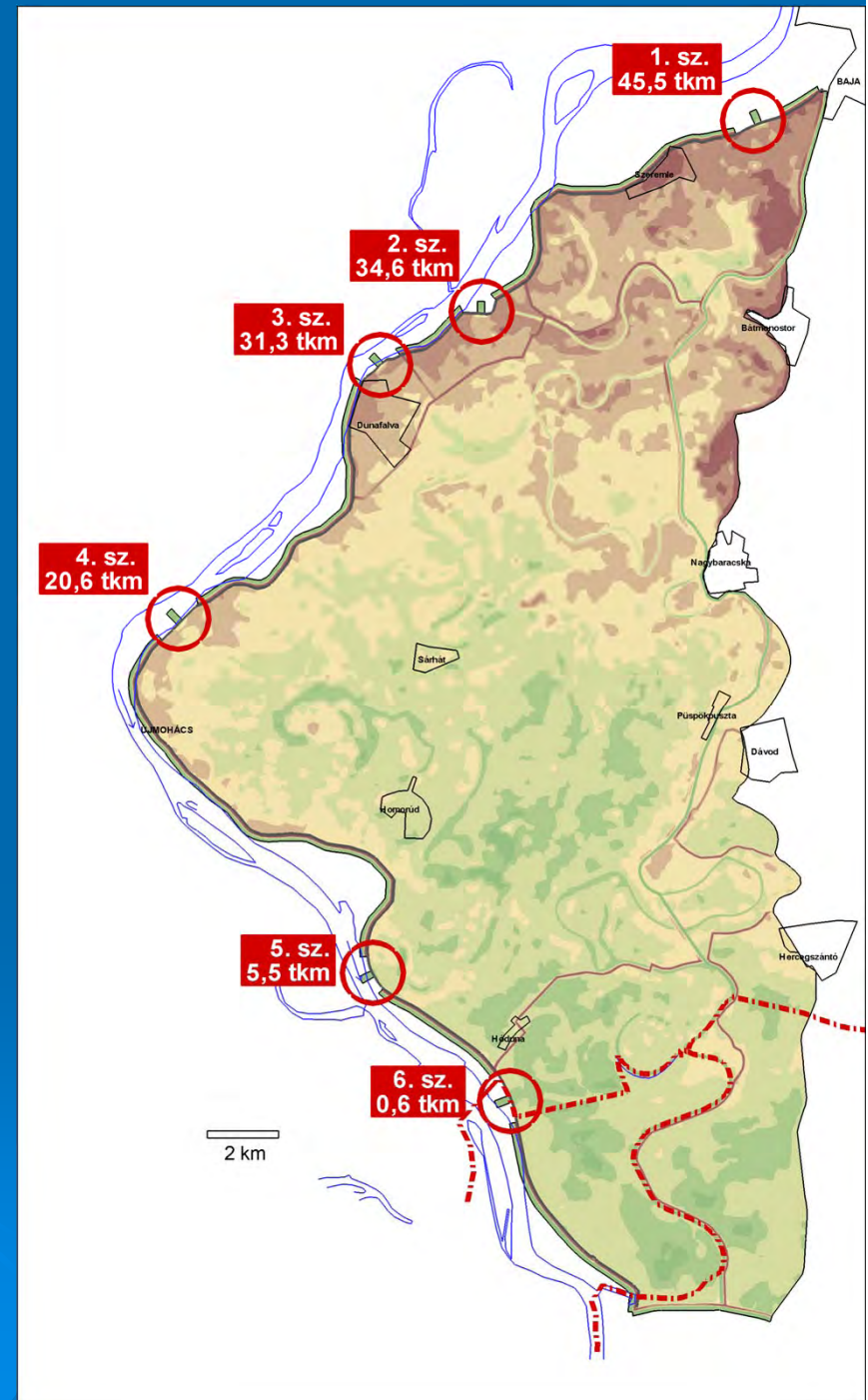
Assignment of rupture location

- The most unfavourable location (expectedly highest level of inundation?)
- The lowest defence capacity location (maybe the lowest level of inundation?)



Assignment of eruption

Knowing the catchment locating more eruption



Matrix of inundation events

(in case of river basin level planning)

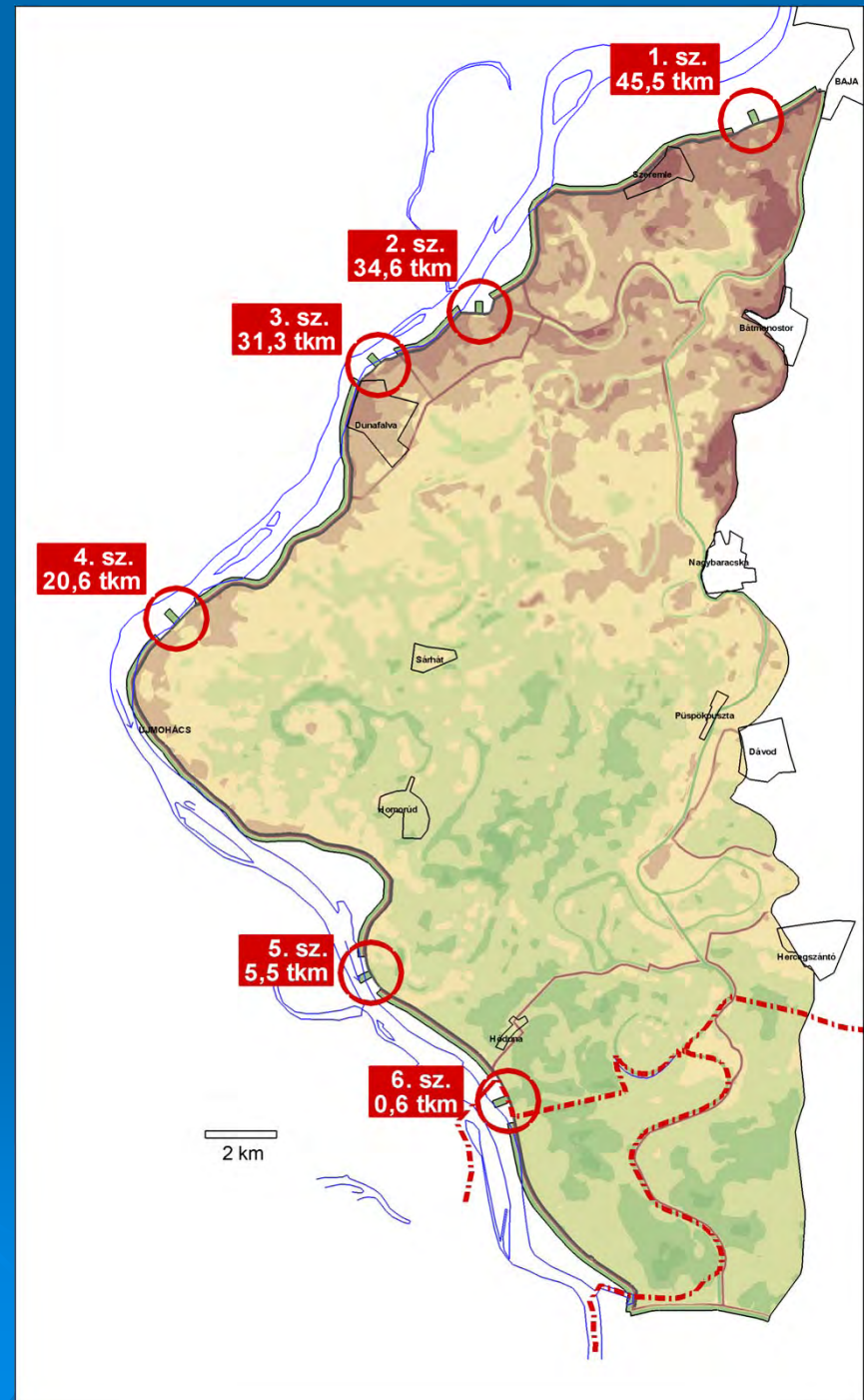
Kis vízfolyások			
Waterspeed v (m/s)	Depth H (m)		
	0–0.5	0.5-3	>3
0–0.5	E11	E21	E31
0.5-2	E12	E22	E32
> 2	E13	E23	E33

Rivers			
Residency period t (d)	Depth H (m)		
	0–0.5	0.5-3	>3
0–5	E11	E21	E31
5-15	E12	E22	E32
>15	E13	E23	E33

Employment in pilot area

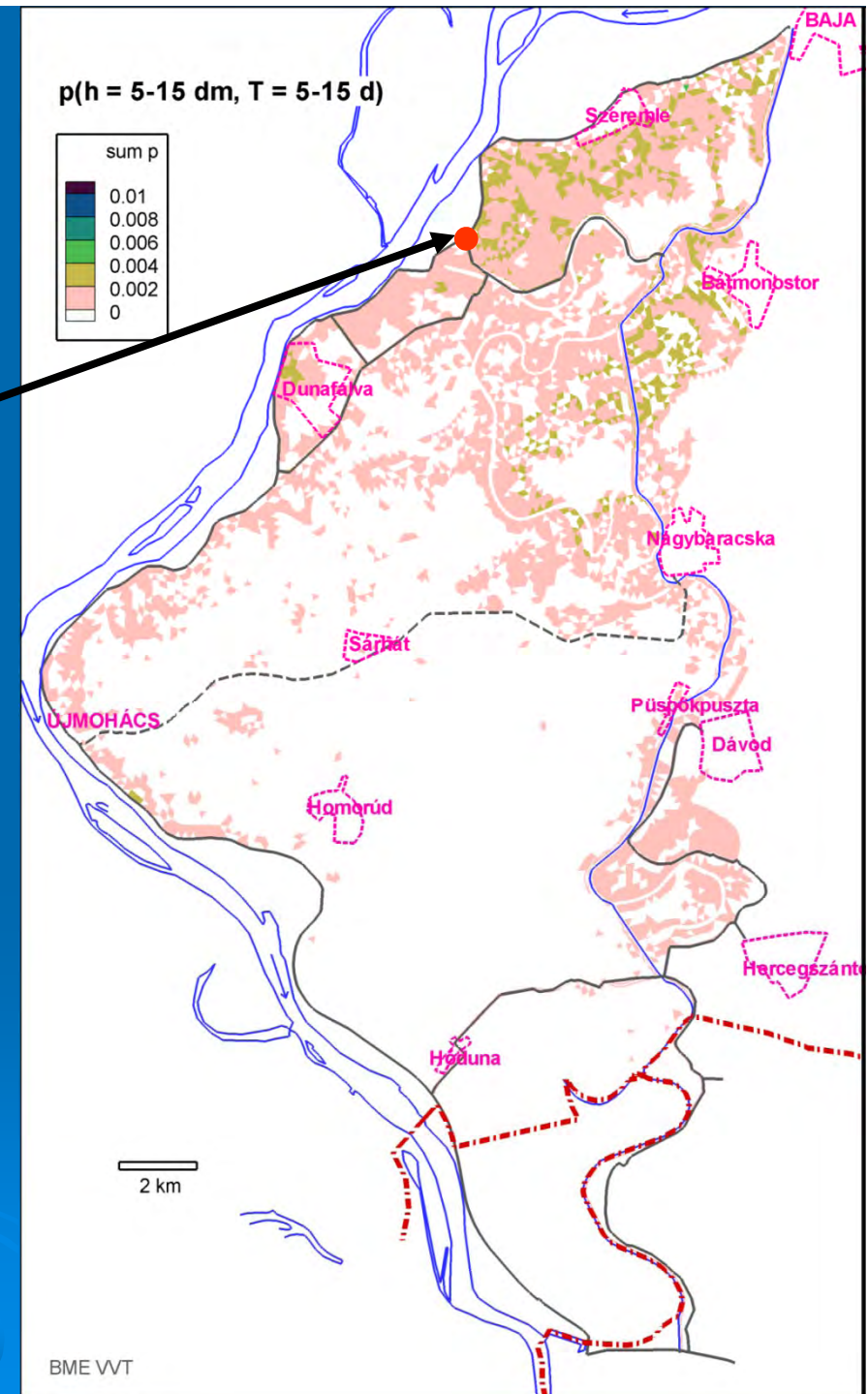
Border condition of eruption:

- developing in 12 hours
- opening to level of surface
- latitude 100 m



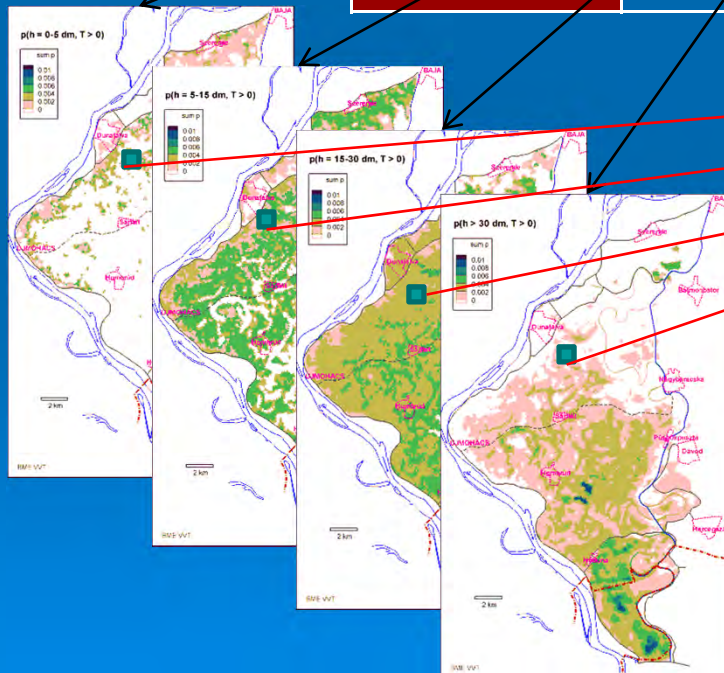
Employment in pilot area

- Eruption at location No.2
- Code E32 event:
 - H= 0.5-1.5 m
 - T= 5-15 d



Basic coherence of risk calculation

Inundational events	T = 0-5 d	T = 5-15 d	T > 15 d	T > 0 d
h = 0-0.5 m	E11	E21	E31	Σ
h = 0.5-1.5 m	E12	E22	E32	Σ
h = 1.5-3.0 m	E13	E23	E33	Σ
h > 3.0 m	E14	E24	E34	Σ
h > 0 dm	Σ	Σ	Σ	Σ



→ $P(E_{11}) = 0$

$$P(E_{12}) = 0,005$$
$$P(E_{11}) = 0,015$$
$$P(E_{11}) = 0,001$$

Effects function: $HF(E_i) = f(E_i)$

Risk:
 $K = \sum_i P(E_i) * HF(E_i)$

An aerial photograph of a rural landscape. A river flows through the center, bordered by dense green trees. The surrounding area consists of large, flat agricultural fields in various shades of brown and green. A small bridge with a blue railing crosses the river in the lower right. The sky is clear and blue.

Thank you for your kind attention!

A hatások

Közvetlen hatások

Vagyoni hatások

- lakóépületek
- ipari, kereskedelmi, logisztikai épületek
- mezőgazdaság
- infrastruktúra
- takarítási, fertőtlenítési költségek

Nem-vagyoni hatások

- emberi egészség károsodása (fizikai, mentális)
- emléktárgyak, házi kedvencek
- műemlékek, régészeti emlékek
- szakrális helyek
- sport- és szórakozási létesítmények
- természetvédelmi oltalom alatt álló értékek
- élő környezeti elemek (növény- és állatfajok, élőhelyek)

Közvetett hatások

- kilakoltatás költségei
- árbevétel kiesések
- árvízvédelmi szolgálatok költségei
- elöntött objektumok miatt fellépő környezetszennyezés (ivóvízbázis szennyeződése, aranykorona-érték csökkenés, talajerózió, stb.)
- vízkészlet-növekedés
- másodlagos vagyoni veszteség

- ki- és visszatelepülés miatti kényelmetlenség
- bizalomvesztés
- a környezet élettelen elemeire gyakorolt hatás (felszíni és felszín alatti vizek, talaj)

Elöntési események mátrixa

(helyi szintű tervezés esetén)

Kis vízfolyások					
Vízsebesség v (m/s)	Vízmélység H (m)				
	0–0.5	0.5-1.0	1.0-2.0	2.0-3.0	3.0>
0–0.5	E11	E21	E31	E41	E51
0.5-1.5	E12	E22	E32	E42	E52
1.5-2.0	E13	E23	E33	E43	E53
> 2	E14	E24	E34	E44	E55

Folyók					
Tartózkodási idő t (d)	Vízmélység H (m)				
	0–0.5	0.5-1.0	1.0-2.0	2.0-3.0	3.0>
0–5	E11	E21	E31	E41	E51
5-15	E12	E22	E32	E42	E52
15-30	E13	E23	E33	E43	E53
>30	E14	E24	E34	E44	E55

Magasság
(mBf.)

92

Diagramterület

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40000

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46000

48000

50000

52000

54000

56000

58000

60000

Szelvényezés (m)

Azonos viselkedésű szakasz

Korona magasság

