Climate adaptation through the multipurpose utilization of emergency flood polders

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EUSDR Thematic Event on Climate Change & Water Management

DANUBE REGION strategy
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Global Water Partnership
Central and Eastern Europe

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Timeline

Major floods

Emergency polders

Flood directive based economic analysis

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Droughts – Adaptation - Ecosystem services

2000

…

…

2020

…

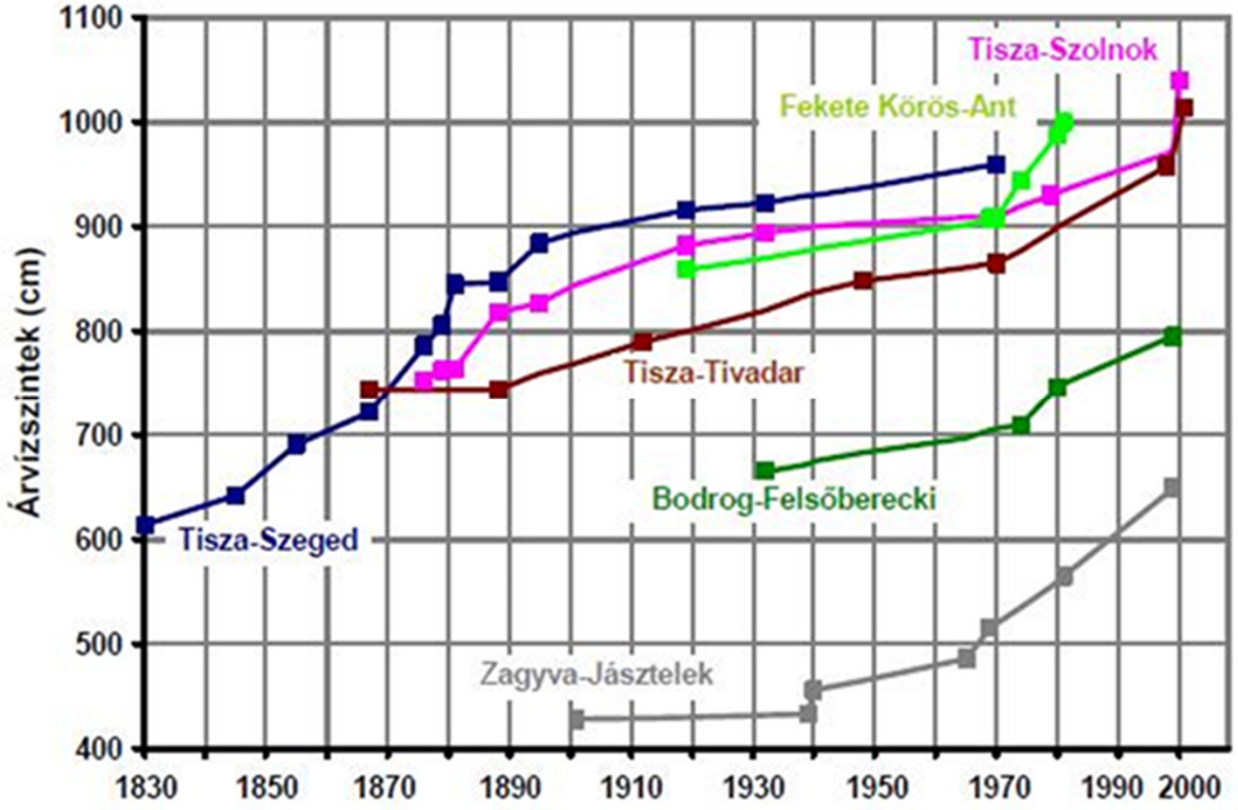
…

Climate change

Record breaking floods

- 1998, 1999, 2000, 2001, 2006, 2010 – major recent floods on the river Tisza.
- 2001 dyke failure at Tarpa (the only major dyke failure of the last few decades)
- **1998, 1999, 2000, 2001: triggered the reconsideration of the flood defense strategy**

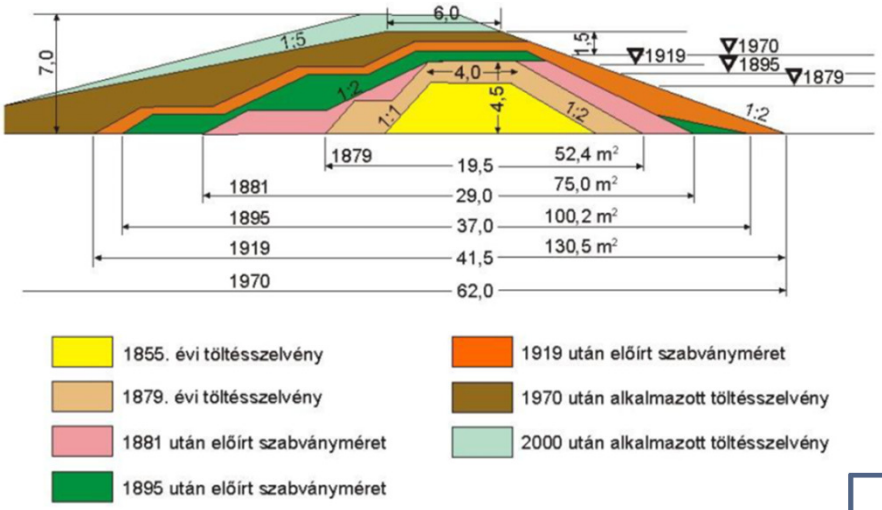
The floods around the Millenium revealed the limits of the defence infrastructure along the Tisza



Higher flood peak levels driven by:

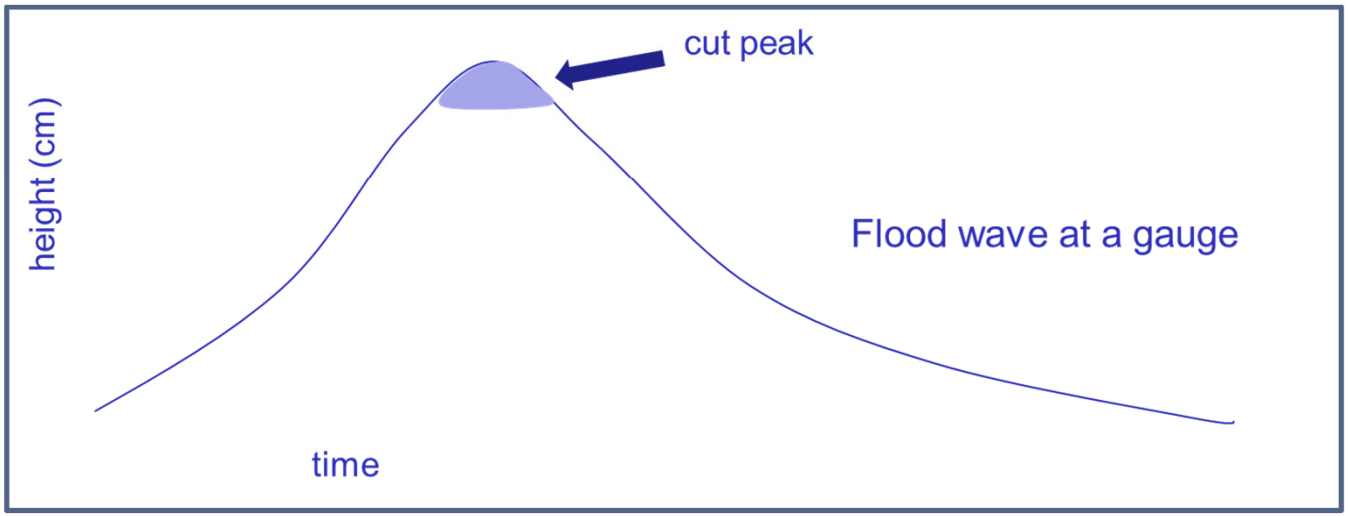
- Land use change in the catchment
- Precipitation pattern, quick snowmelt (climate change)
- River bed sedimentation

Higher dykes vs. emergency polders?



Árvízvédelmi töltések magasságának növekedése Vágás I. nyomán

Pre-existing polder experience from tributary rivers of the Tisza



Development and operation of the polders

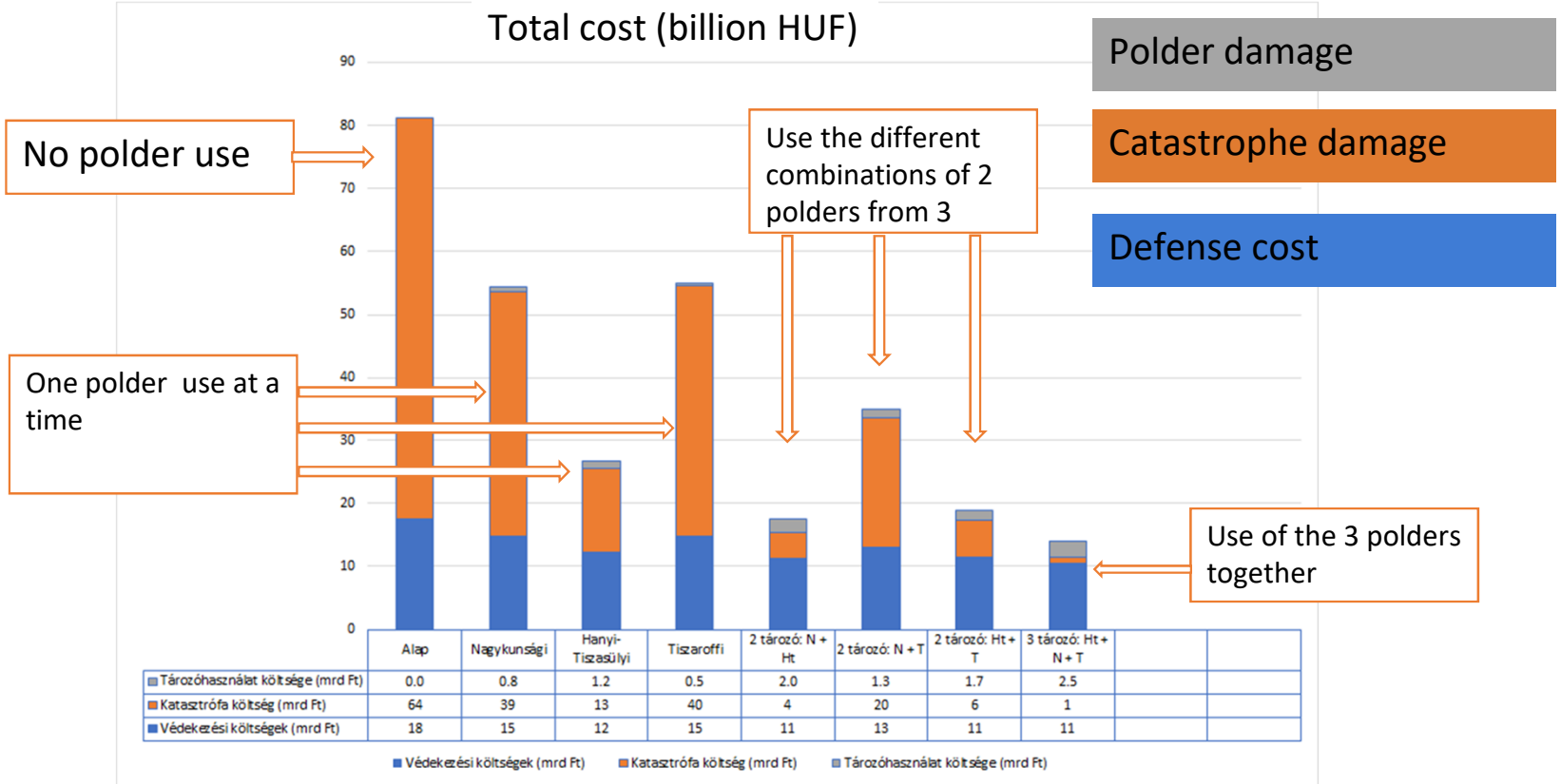
- Decision based on a cost minimazation analysis, period 2001-2004
  - Further dike elevation proved prohibitively expensive
  - Opened the way to the development of polders.
- Plan: Polder use in case of 100 year floods or less frequent events, when the defense capacity of the dike infrastructure is overtopped
- Compensation of farmers: land value based initial payment and an event based compensation for farmers in the polder.

Quantified risk assessment based polder use

- Flood risk maps developed for the Flood Directive utilised for the system optimisation of the operation of polders (2018)
- Quantified risk assessment based cost benefit approach
  - The benefit of risk reduction downstream on the expense of compensation for inundation damages inside the polder

Flood simulation based economic results

- CBA of opening a polder: The total cost reduction (polder damage + flood defense + expected catastrophe damage). The year 2000 flood.



Economic inflection point of polder use

- Which flood return period justfies polder use? Much less than once in 100 years, in other words, polders should already be used for smaller floods.
- The polders generate benefits (in terms of reduced flood risk) quite frequently.

Name of the polder	River	Economic inflection point (flood return period, years)
Cigándi	Tisza (Upper Tisza)	21
Szamos-Kraszna-közi	Tisza (Upper Tisza)	43
Beregi	Tisza (Upper Tisza)	49
Tiszaroffi	Tisza (Middle Tisza)	20
Hanyi-Tiszasülyi	Tisza (Middle Tisza)	21
Nagykunsági	Tisza (Middle Tisza)	21
Borsóhalmi	Zagyva	26
Jásztelki	Zagyva	28
Kutas	Berettyó	24
Halaspusztai	Berettyó, Sebes-Körös	24
Mályvádi	Fekete-Körös	17
Kis-Delta	Fehér-Körös	13
Mérgesi	Kettős-Körös	25

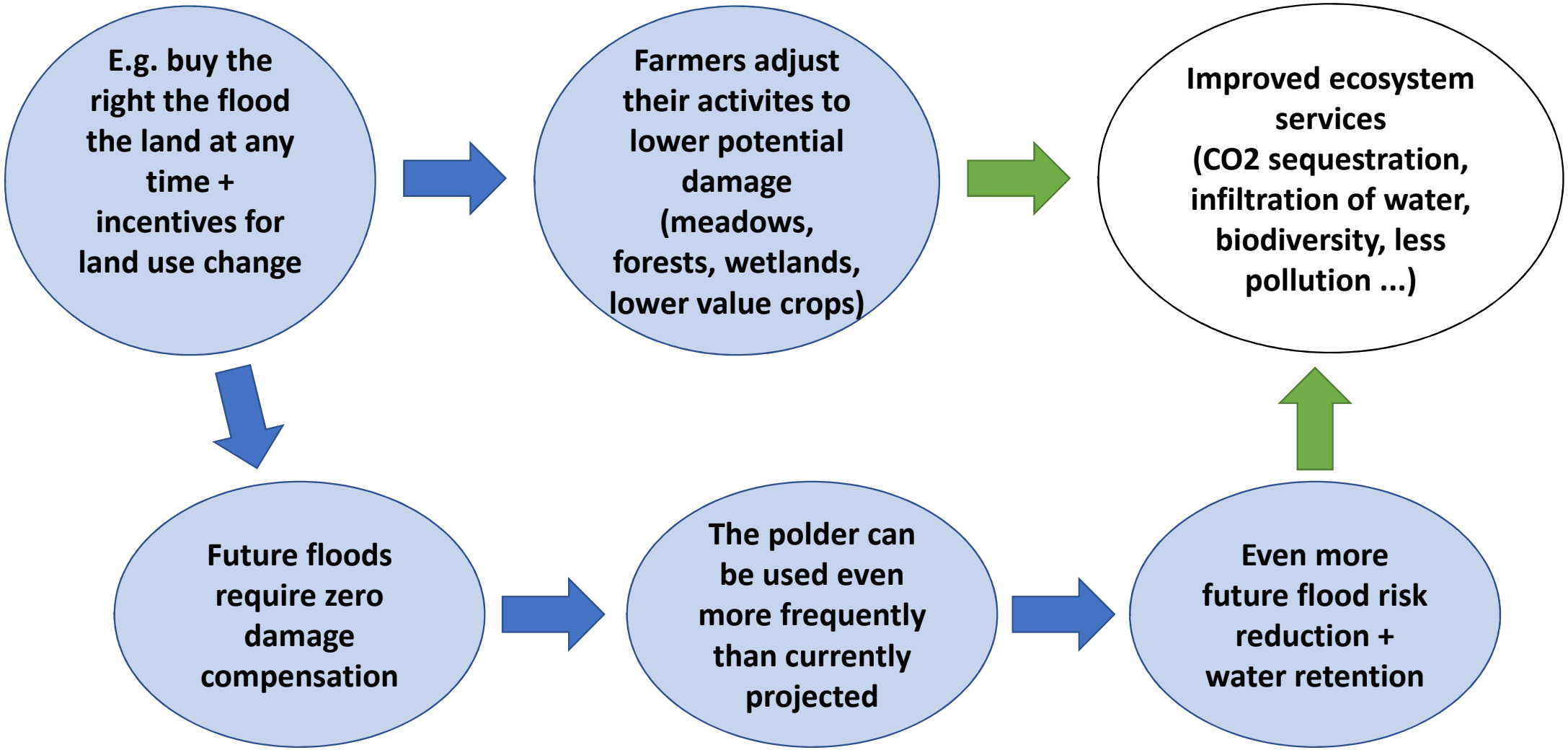
For some polders:

the discounted value of the sum of future benefits > the current value of land!

- Instead of paying compensation for agricultural losses, why not seek other types of agreements with the farmers?

Flood polder	Present value of risk reduction for the next 75 years (1000 HUF/hectare)		Average value of land (1000 HUF/hectare)
	Minimum	Maximum	
Beregi	674	1194	1290
Szamos-Krasznaközi	1056	1870	1484
Cigándi	968	1714	923
Nagykunsági	1195	2115	1242
Hanyi-Tiszasülyi	1620	2869	1369
Tiszaroffi	1449	2565	1242

Enhanced polder use



Thank you for your attention

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