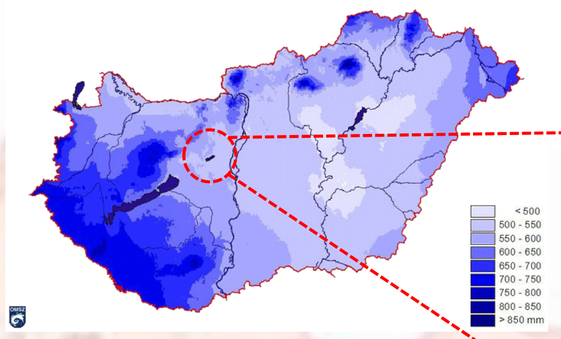
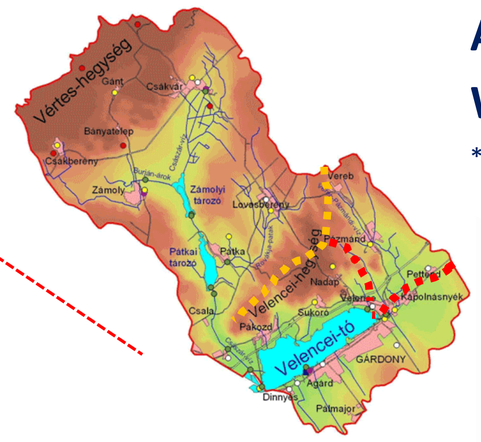
Impact of nature-based solutions on the water balance of Lake Velence

SZÉCHENYI EGYETEM
UNIVERSITY OF GYŐR

Problem statement

Due to climate change settlements and their outskirts have **higher water demand**.
The small gardens, fruit trees and vineyards in the area are currently exposed to the unpredictable rainfalls.





Catchment: appr. 600 km²

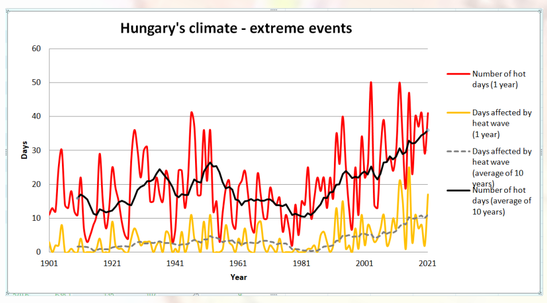
Surface area: appr. 25 km²

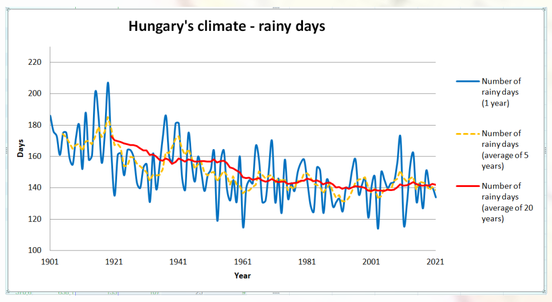
Average depth: 1.5 m

Water volume*: 37.5x10⁶ m³

* when average water depth is 1.5 meters

3 catchments:**
Császár-creek (North/West) ~ 60%
Southern flatland (South) ~ 20%
Vereb-creek (North-East) ~ 20%
** based on rainwater accumulation





Can blue-green infrastructures solve the water demand issues?

Area transformation: increasing orchard and vineyard areas

Climate change

- **evaporation**
  (increasing temperature & extreme events)
- **uncertain precipitation**
  (fluctuating and uncertain precipitation events, decreasing precipitation days)

Nature-based solutions (NbS)

Challenges:
- No water utility network
- Sinking water table
- Longer precipitation-free periods
- Food safety issues (corn, wheat)
- Increased grape production (viticulture)
- Ecologically protected area
- Small private areas, many owners

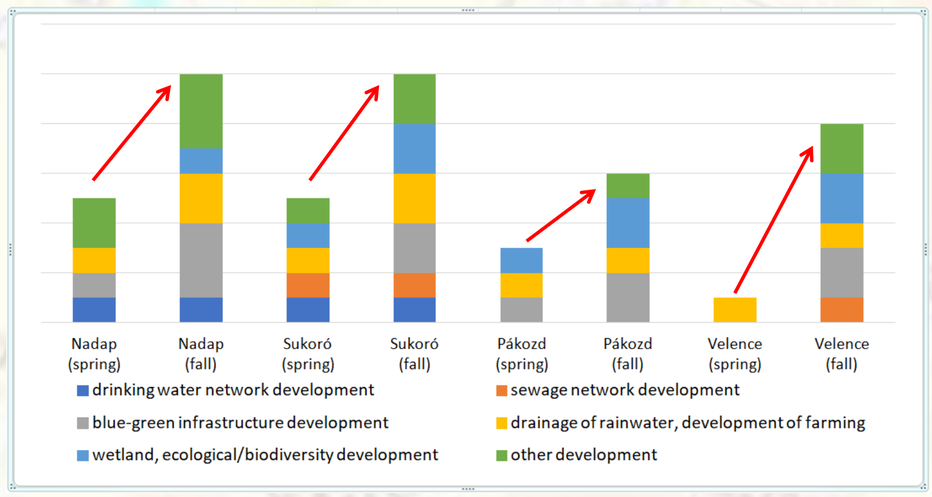
Retention pond
Detention pond
Rain garden

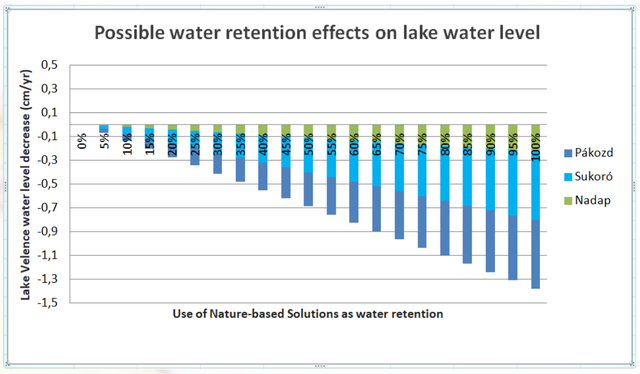
Source: BTL Liners, water retention for wineries

Stakeholder involvement

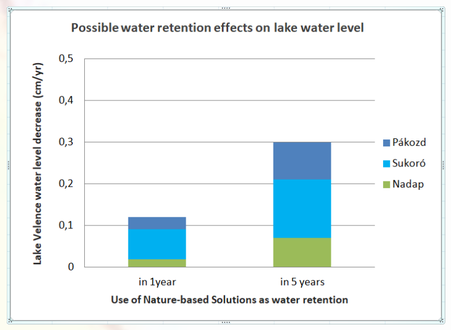
2020
↓
2022

Extreme drought in 2022 had some positive side affects: Development map around Lake Velence has undergone severe changes as a result of extreme drought in 2022
(based on mayors' answers, 2022 early spring – 2022 fall)

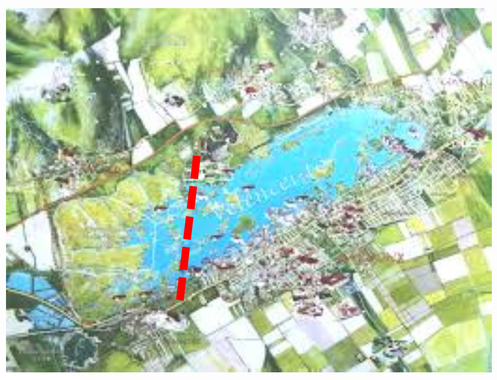




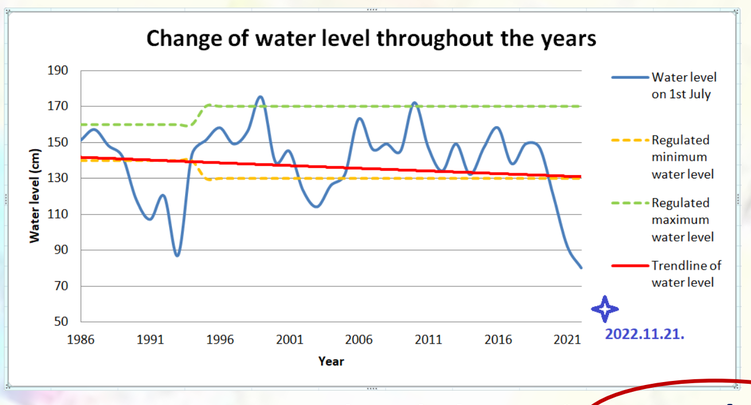
At present: low usage of nature-based solutions and water retention
Future/attitude: this year's extreme drought had a significant impact



Characteristics of the lake



2 regions:
- **open surface (East) -> $^{2}/_{3}$**
  touristic demand:
  high water level
- **reed cover (West) -> $^{1}/_{3}$**
  ecology demand:
  high or shallow water level



(36 years avr. water level change) = - 1cm/yr ⁺
⁺ 1986-2022 – decrease of water level

250,000 m³ water ≈ 1 cm of lake water level

Future
Extensive water retention by municipalities and the population may have an impact on the lake budget.

Discussion:

- NbS are effective tools to irrigation challenges in catchment of lake Velence
- Local benefits far exceed the negative impact on the catchment water budget
- In ecologically vulnerable watershed, nature-based solutions need to be applied in an integrated way on an ecologically vulnerable watershed

Future plans:

- Raising social awareness through workshops and education
- Inclusion of all settlements in the integrated water management in the watershed
- Extended water budget and retention calculations based on stakeholder involvement
- Determine location and impact of nature-based solutions using SWMM

Contact information

[1]**Attila Kálmán**, PhD student, at.kalman@gmail.com , Széchenyi István University, Győr, Hungary
[1]**Dr. Katalin Bene PhD**, associate professor, benekati@sze.hu , Széchenyi István University, Győr, Hungary
National Laboratory for Water Science and Water Security, Széchenyi István University of Győr, Department of Transport Infrastructure and Water Resources Engineering, Egyetem tér 1, Győr 9026, Hungary

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