Restoration of the aquatic and terrestrial ecosystem complex
of Fundu Mare Island

Hydrological situation and suggested options for restoration

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CEDREN
Centre for Environmental Design of Renewable Energy

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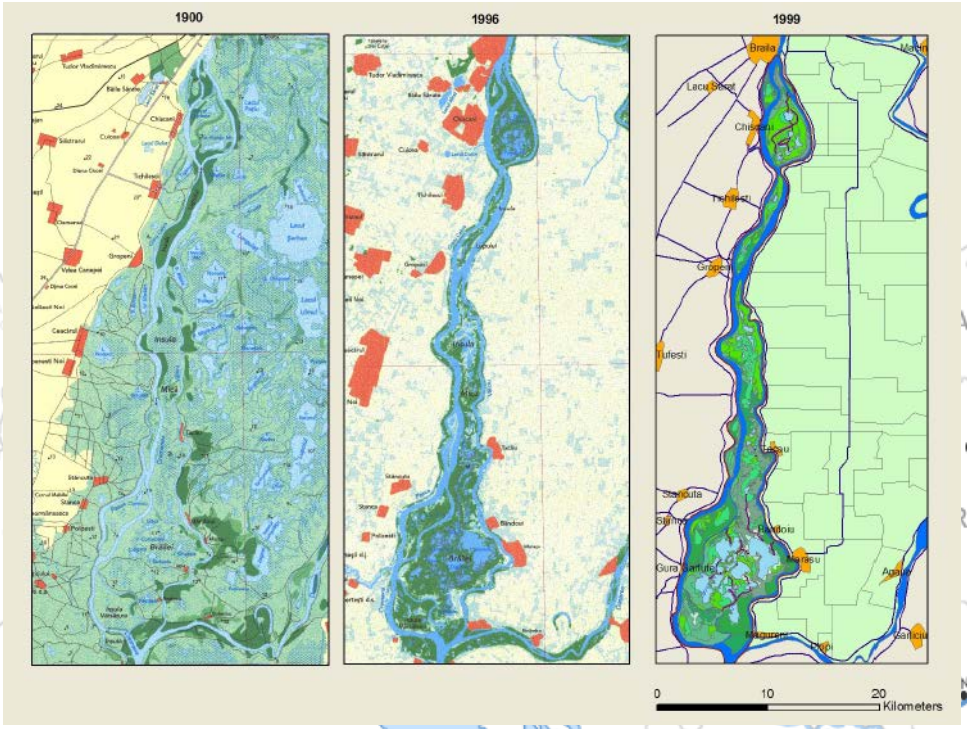
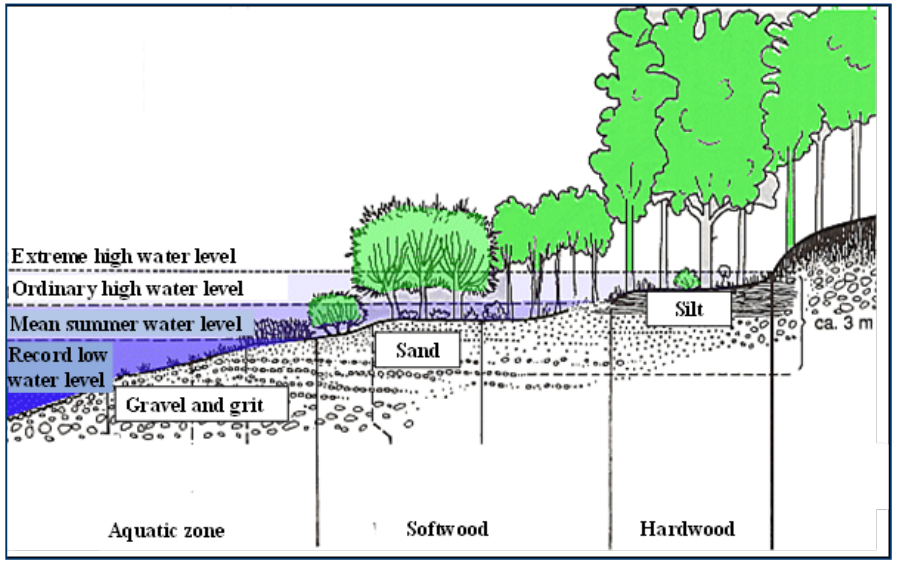
Introduction

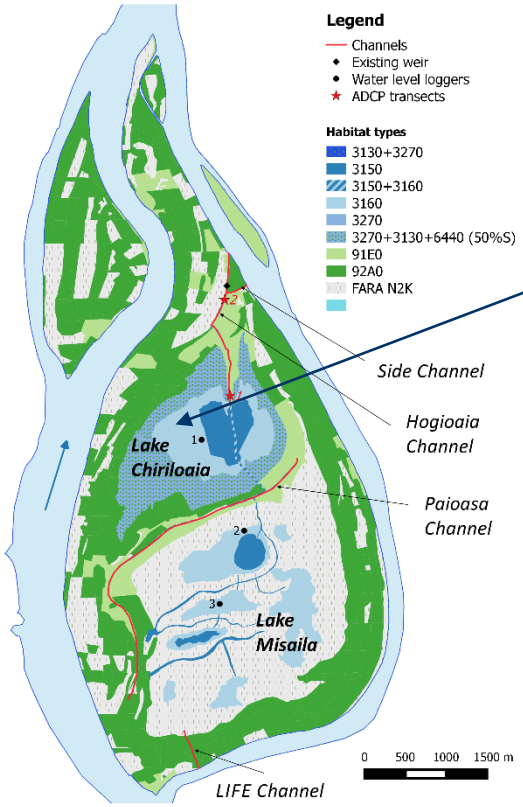


Hydrological restoration – why?

Lakes dry out during summer: Aquatic vegetation has decreased, and willow encroachment has been observed – with negative consequences for fish and birds



SWB Habitat map



EU habitat 3160:
"Natural dystrophic lakes and ponds" (e.g. water lily)

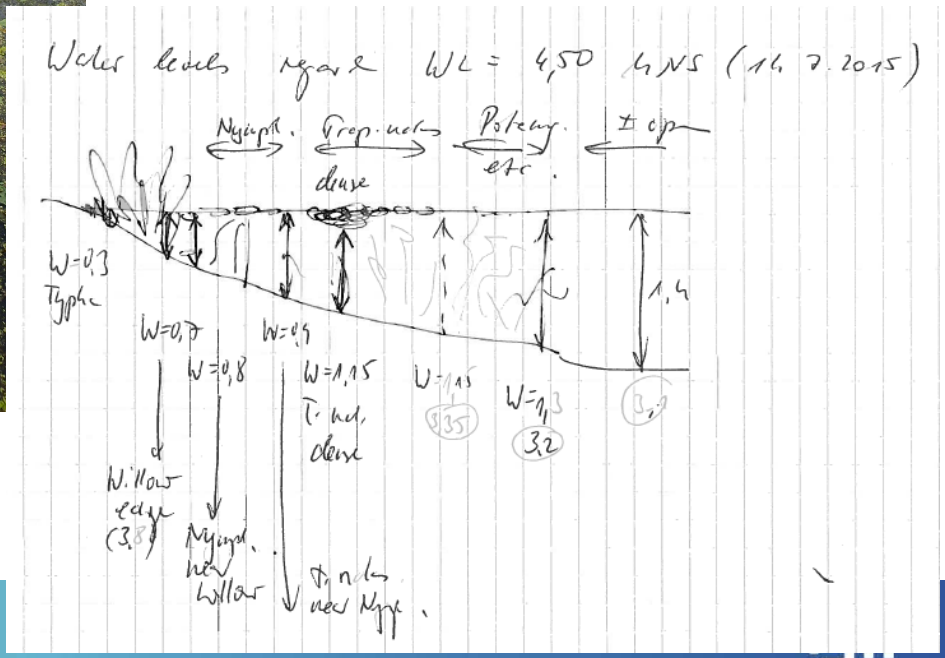
willows

Hydrological measurements

June 2015: Installation of three SINTEF-WL-loggers at the island
July 2015: two weeks of field work (and many other experiences) by Joe and Peggy

Spotwise water depth measurements

July 2015

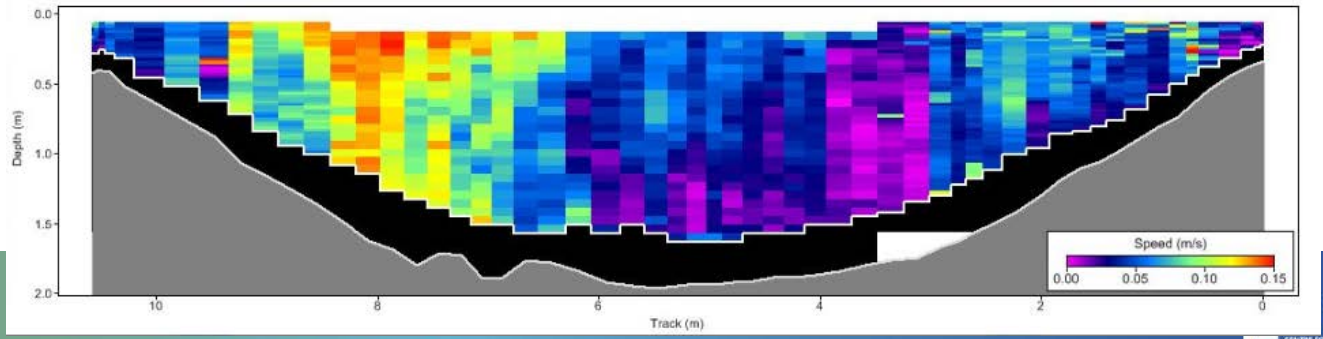


Spot-wise investigations of water depth and vegetation

Hydrodynamic measurements

July 2015

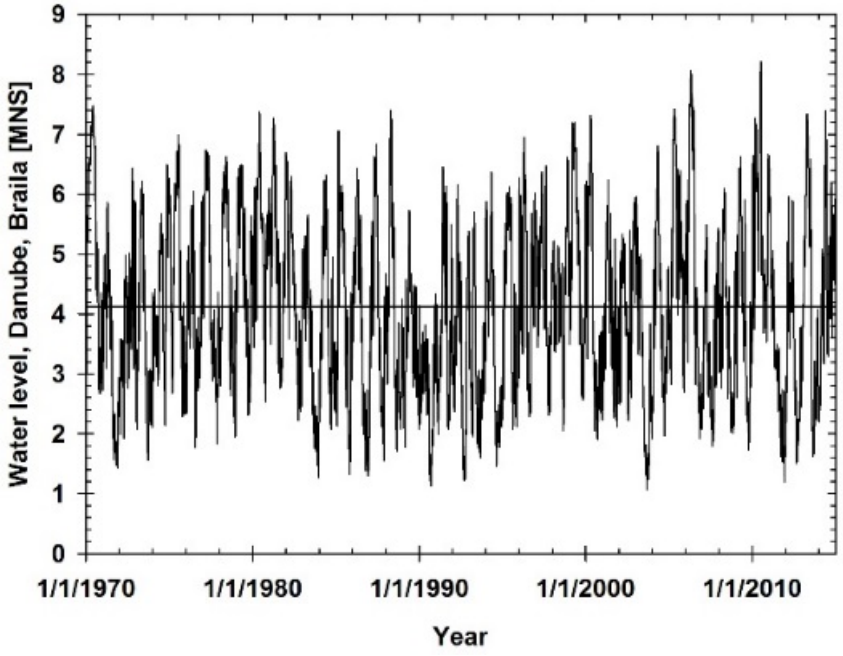
Measurement of discharges and flow velocities using hand-held ADV (Sontek Flow Tracker) and ADCP (Sontek M9)



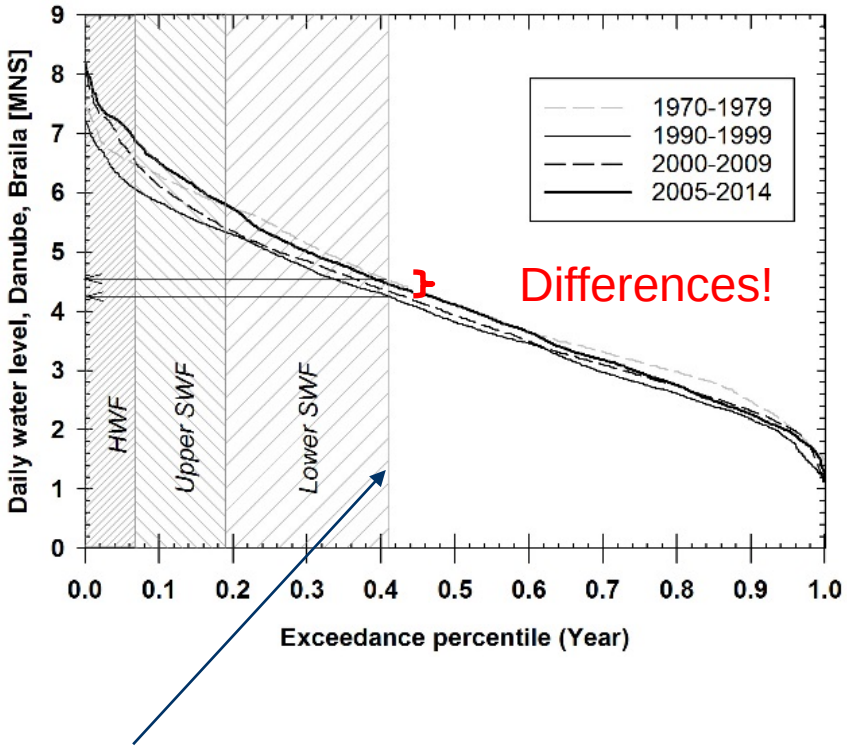
Hydromorphological and vegetation analysis

SWF = Softwood floodplain forest
HWF = Hardwood floodplain forest

Water level, Danube, Braila,
Time series 1970-2014,
Mean daily values

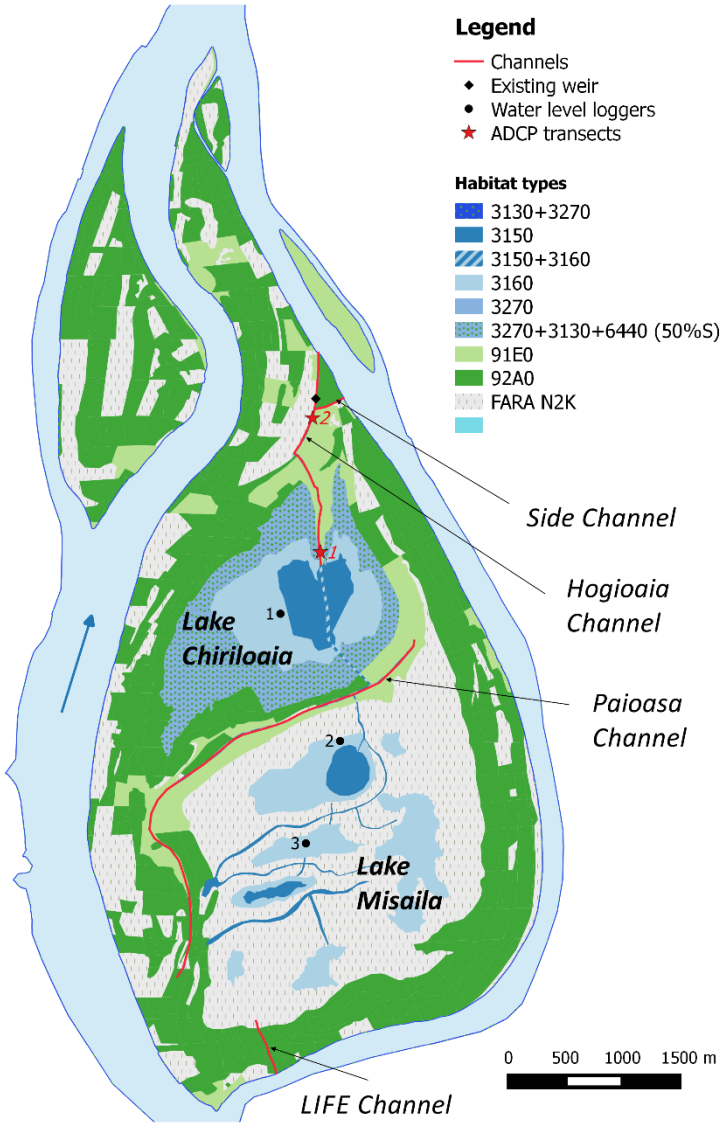


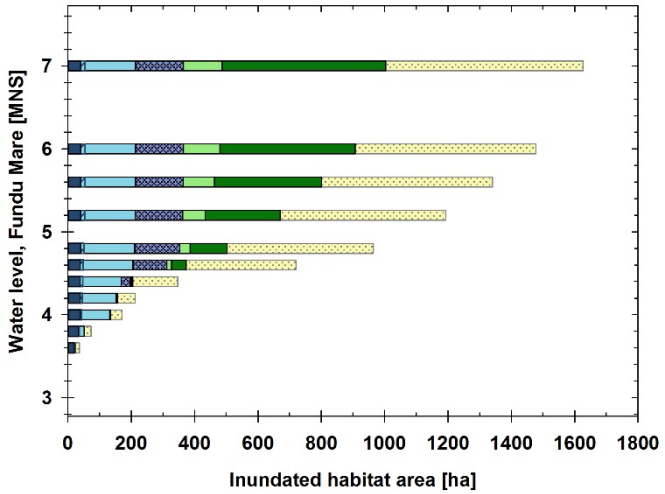
Flow duration curve



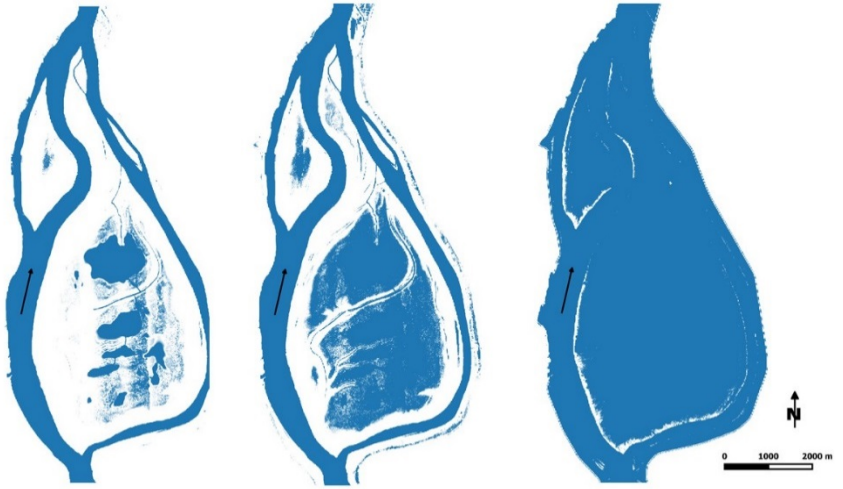
Approx. threshold inundation duration for establisment of woody floodplain vegetation (e.g. willows)

Hydromorphological and vegetation analysis

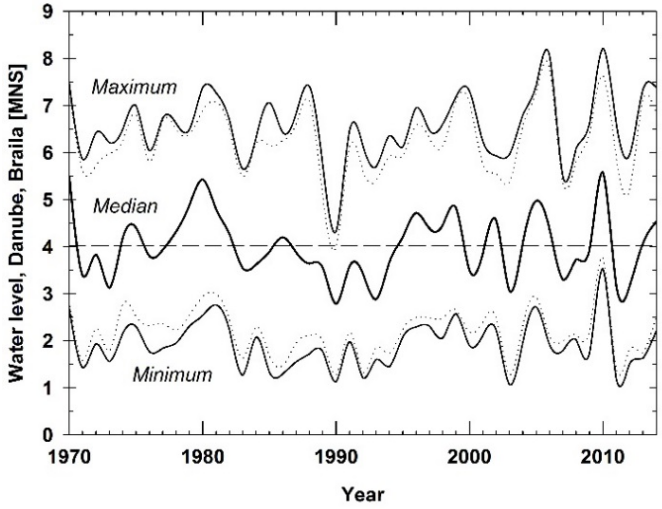




W ~ 4.4 MNS W ~ 4.8 MNS W ~ 7.0 MNS

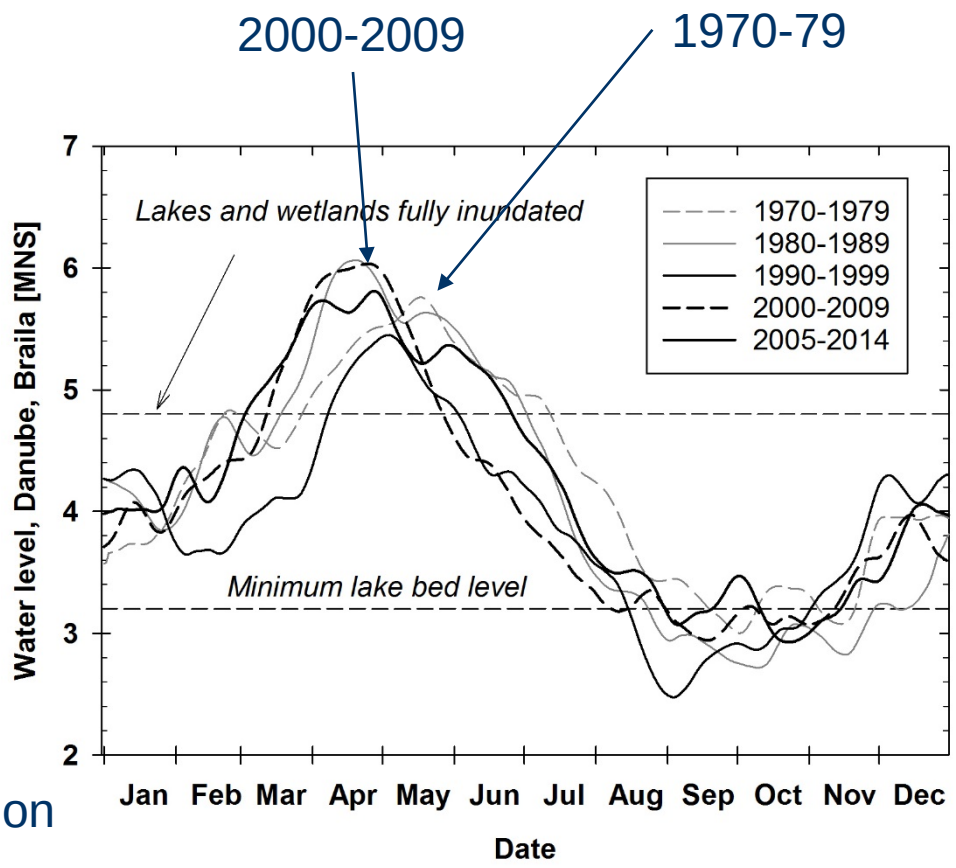


Hydromorphological and vegetation analysis



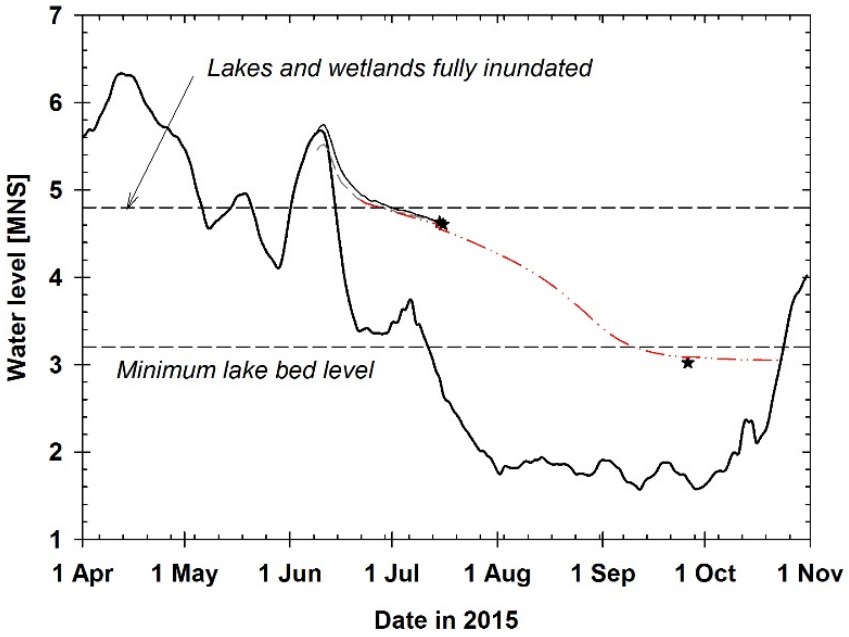
Water level, Danube, Braila, Time series 1970-2014, Annual min, median and max values

Spring flood peak:



Seasonal distribution

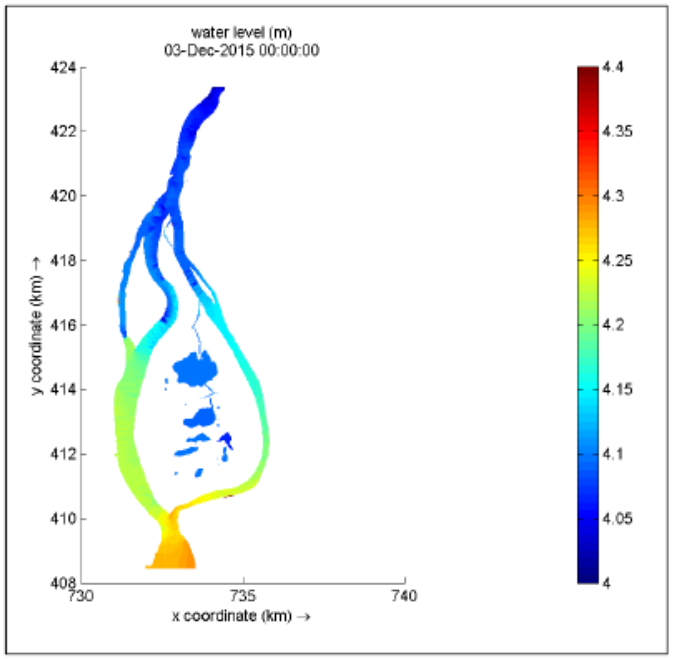
Water levels at the island



Water levels on the island are affected by

- Unsteady flow processes
- Ground water leakage
- Precipitation minus evapotranspiration
- Hydraulic structures (weirs etc.)

Set-up and application of a hydrodynamic model



Problem:
The morphological input data was of insufficient quality for an advanced model – we had to switch to a simple water balance approache.

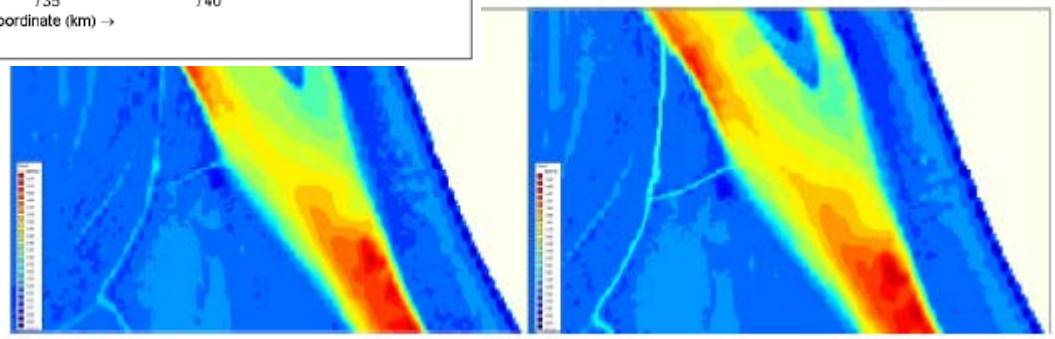


Figure 26. Depth-values of the channel and the weir on the island before (left) and after correction (right)

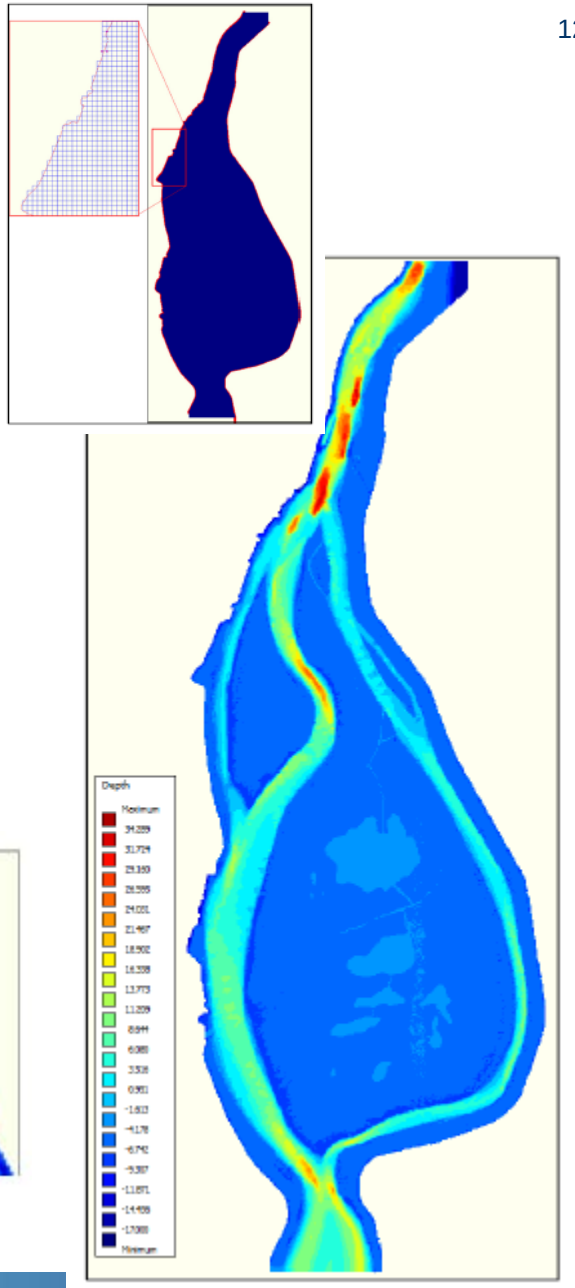
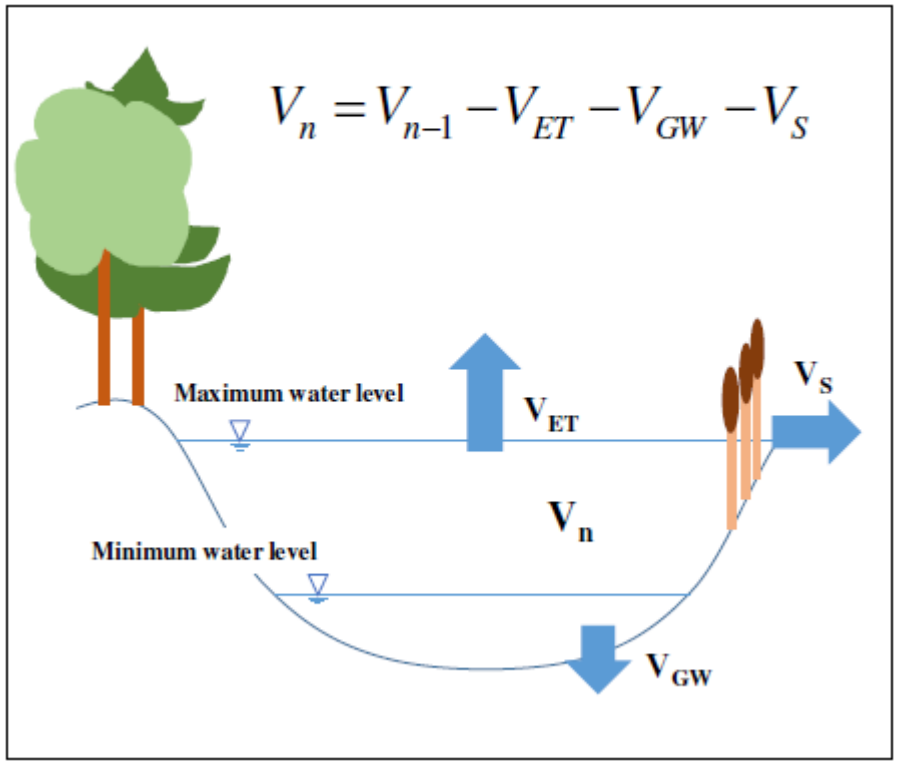
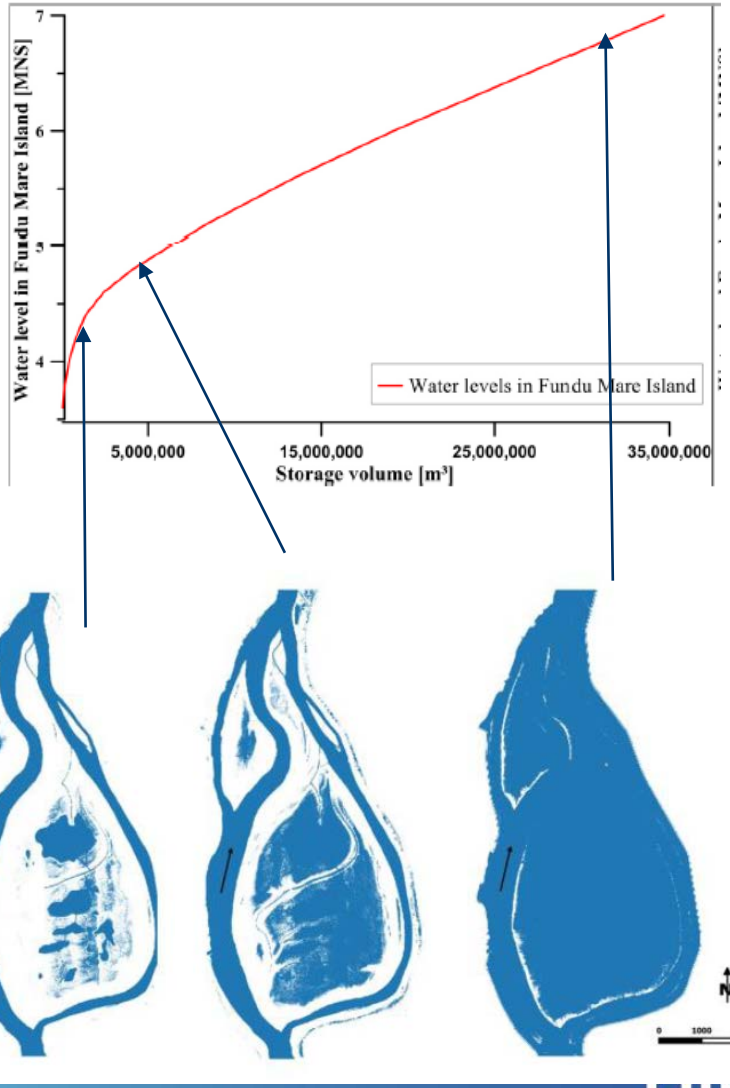


Figure 25. Depth value distribution on the grid in mNS

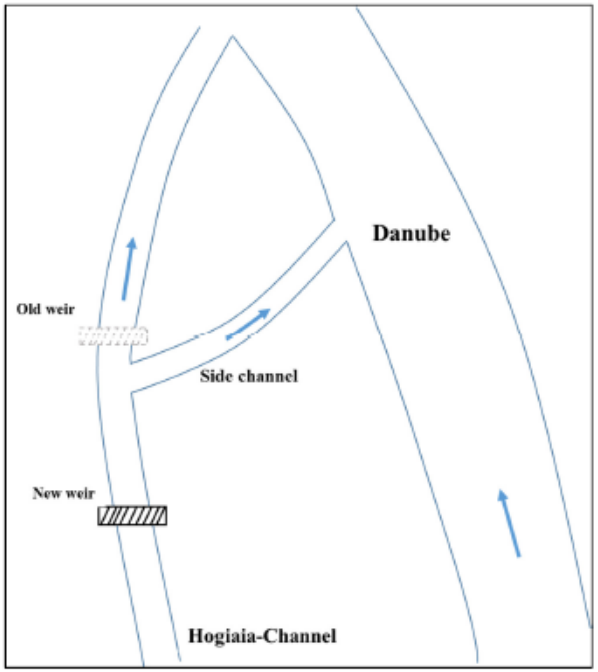
Water balance approach used for assessment of different scenarios

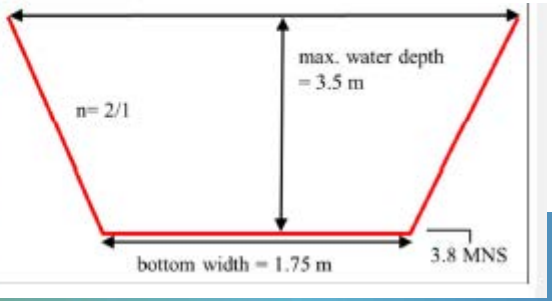




ET = Evaporation loss
GW = Groundwater leakage
S = Surface runoff (channel discharges)

Estimate effects of different restoration scenarios

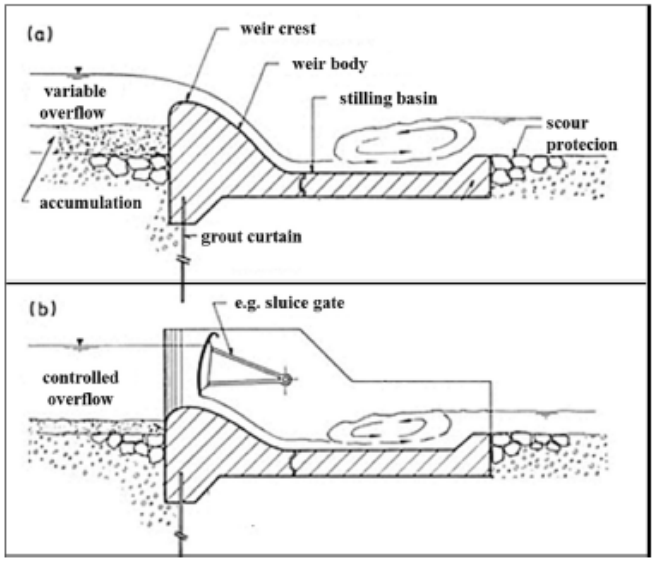




Master thesis
Muriel Brückner

Hydraulic investigation of different weir types

Master thesis Muriel Brückner



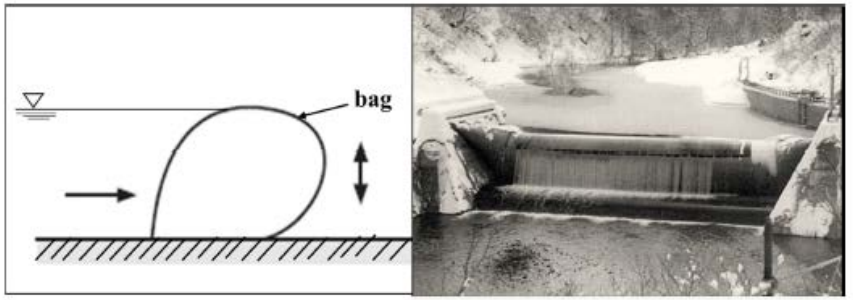


Figure 7. Bag weir; left picture is a sketch (Giesecke et al., 2014, modified) and the right pictures shows an example of an air-filled membrane weir near the Kurotani dam, Japan (Gebhardt, 2006)

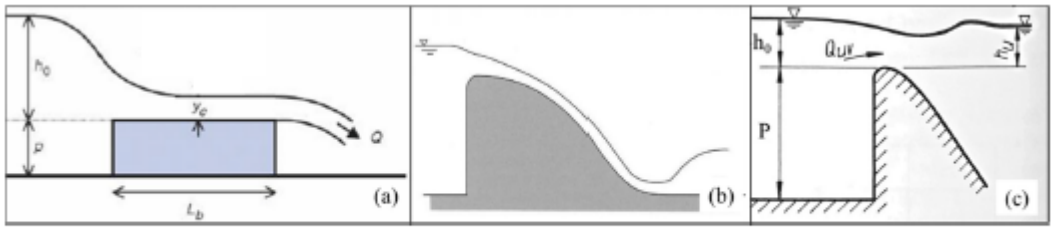


Figure 5. Sketch of different weir crest types. (a) broad-crested weir, (b) streamlined design (Novak et al., 2007, modified), (c) effect of high tailwater (Bollrich, 2007, modified)

Figure 8. Rockfilled slide in the Aich River (LUBW, 2005)

Inundation duration at Fundu Mare Island for different scenarios

Assessment for «mean conditions» based on the Danube water levels for the decade 2000-2009

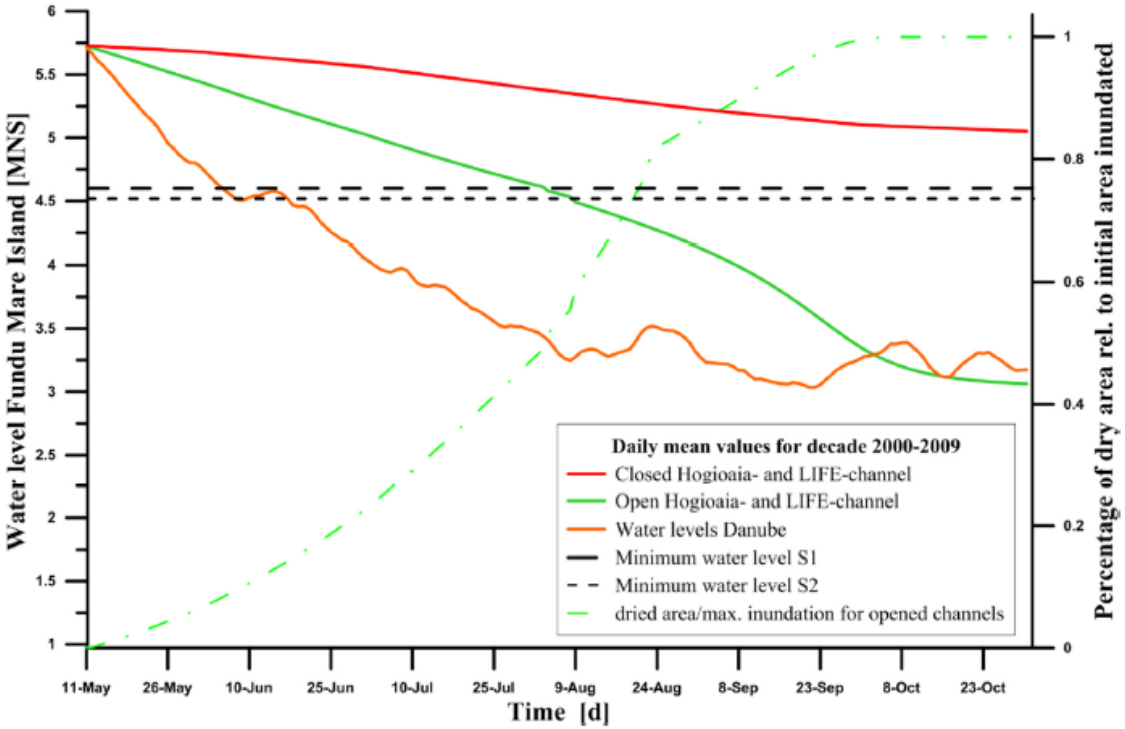
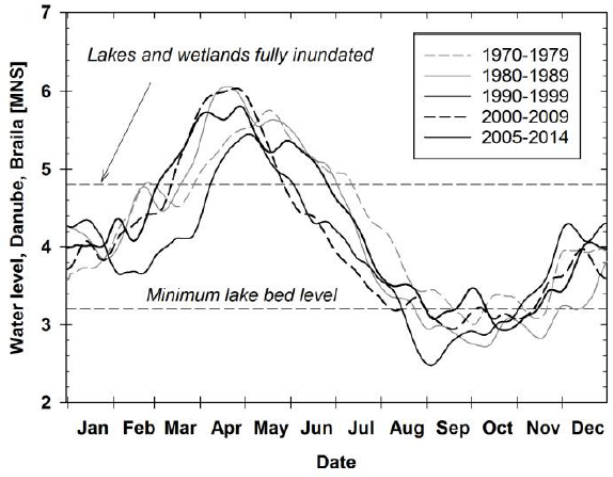
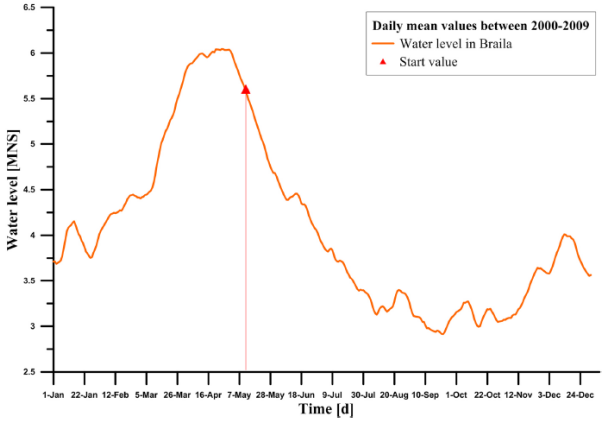


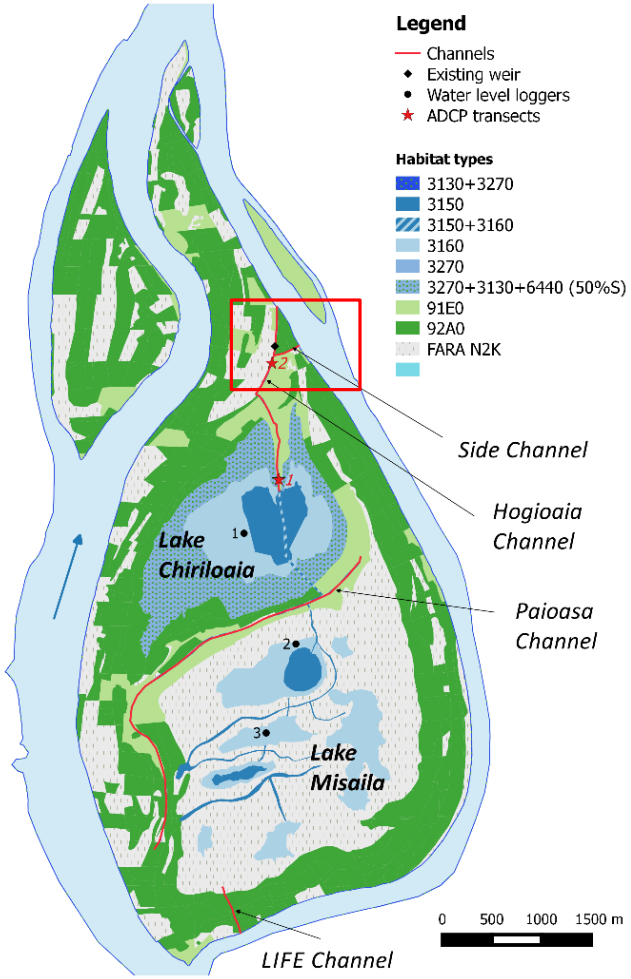
Figure 40. Comparison of fully dammed (red graph) and fully opened channels (green graphs) in Fundu Mare Island.

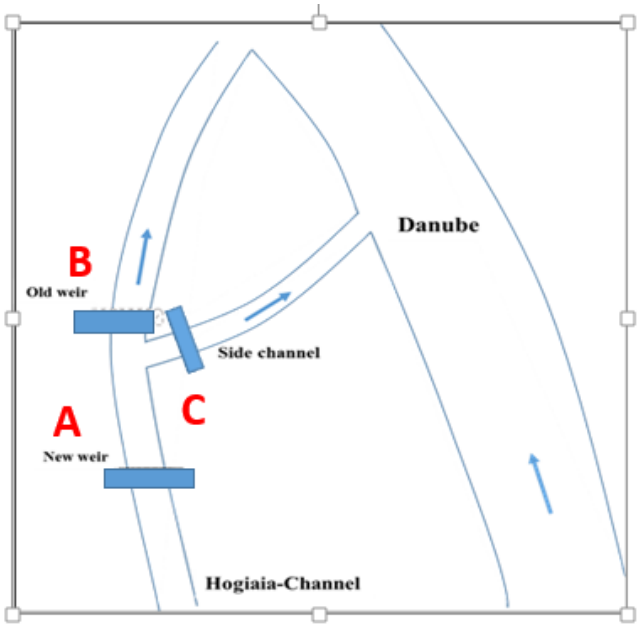




Master thesis Muriel Brückner

Suggested options for weirs





Regulate discharge at the outlet of Hogioaia channel (only A, or rather B and C – to be discussed during the workshop)

Close LIFE-Channel!

Thank you!