ClimateWater Project Mid-term workshop
Report for
WP 3.6: Strategies to combat climate change induced water pollution

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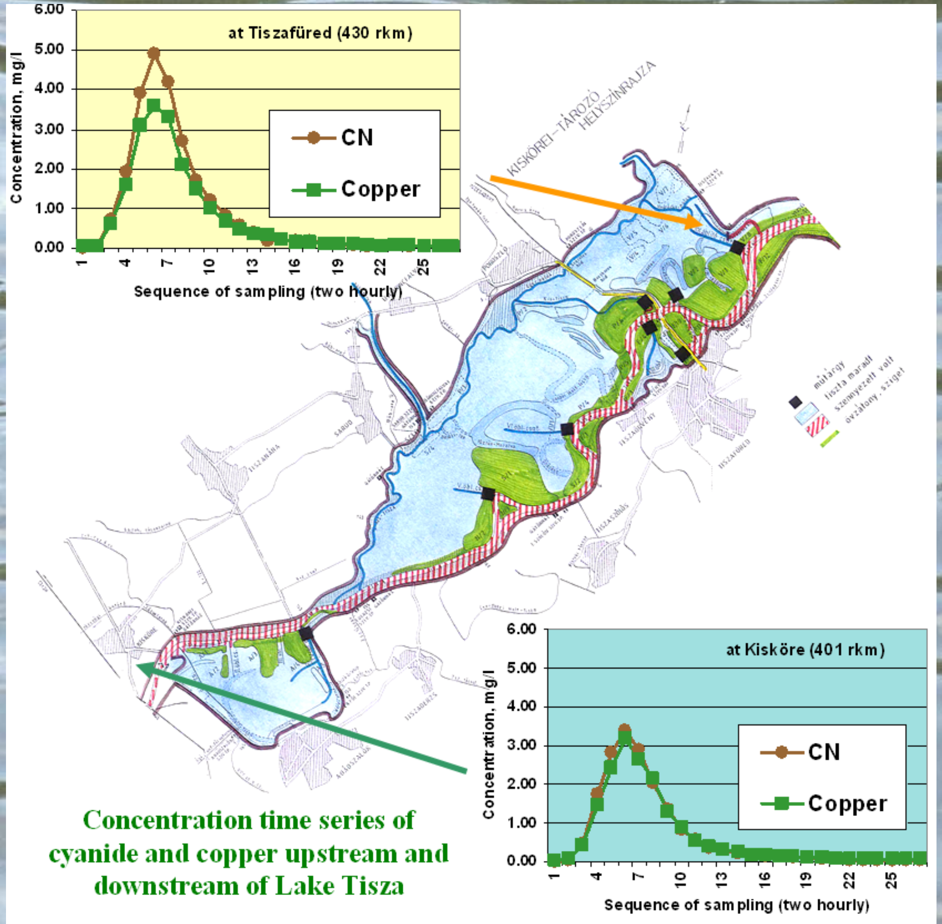
Large-many water quality impacts were identified but, the adaptation strategies fall into three categories:

1. **Dilution (which is not a solution to pollution as stated by a basic rule or rather axiom of water pollution control);**
2. **Tailoring waste- and sewage-water treatment technologies to the altered climate change induced situation and**
3. **Application of diffuse or non point source pollution control techniques (the BAT and very new ones). This will be the most critical issue**

Dilution as an adaptation strategy for water pollution(quality) control

Although in principle not acceptable, it might be needed in serious cases of water quality deterioration and the storage volumes will be available for other purposes, such as fighting drought.

This might be an important supporting case from the near past: the effect of the dilution provided by the Lake Tisza reservoir for the cyanide waves of the Baia Mare catastrophe



Concentration time series of cyanide and copper upstream and downstream of Lake Tisza

Tailoring waste- and sewage-water treatment technologies to the altered climate change induced situation

Nearly all projects and documents mention the need for upgrading wastewater treatment technologies.
However, this cannot be reviewed for all the possible industries. The climate impact situation and the price of water, the charge on environmental load and the penalty-incentive systems of adaptation will surely bring the required technologies

A related critical issue is the inadequacy of sewer systems in draining the much increased and much more flushy urban stormrunoff volumes.

The overflown combined systems are causing serious health risk but separated systems also cause serious pollution and inundation problems

The solution is expensive: Enlarge, expand canal systems or to build entirely new ones, with the ecological treatment of overflow waters

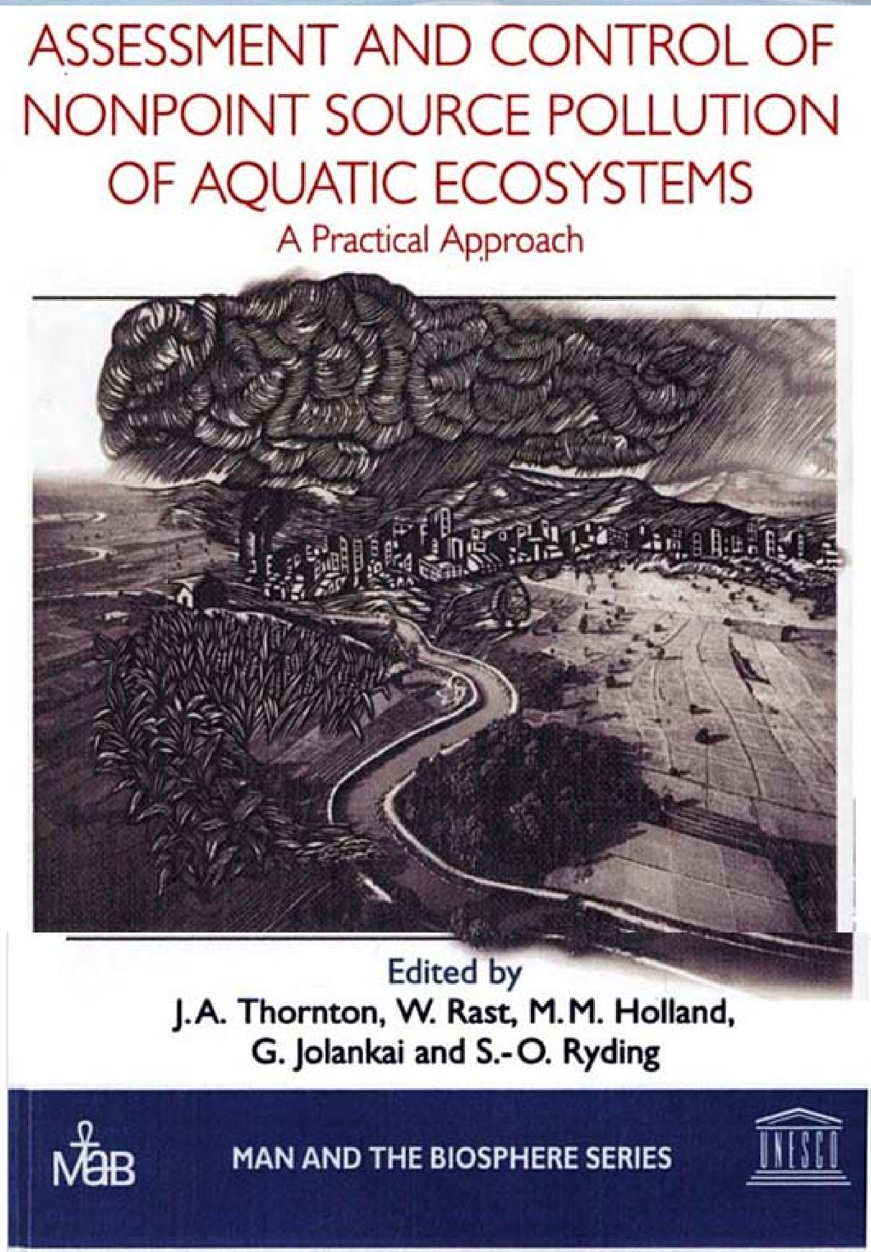
Application of diffuse or non point source pollution control techniques

A proven fact is that non-point sources represented the larger part of total annual load of water pollutants for many parameters (BOD, COD, TP, several micropollutants, etc) for the last few decades.

In Europe with the success and progress of WFD induced sewer and sewage treatment development this weight was dramatically increasing!

A further increase is being experienced with flashy, more fierce and intensive rainfall-runoff, induced by Climate Change

Non point source pollution control techniques continued



One of the problems is that although we do know the NPS techniques, even BAT is available, we still do not know (at design support level) their pollutant removal capacity and efficiency.!!!!

This is because very few experimental data are available.

All the NPS techniques, together with the hydrological-hydraulic management techniquest can be called ECOHYDROLOGY

What we mostly need in controlling climate-change induced water pollution is to highly intensify research into ECOHYDROLOGY. Firstly with experimental measurements on the capacities and efficienty of the known control strategies. Next to identify strategies that are not yet known (especially on improving the functioning, resiliance and resistance of terrrestrial-ecotone-aquatic ecosytems by means of „water management”, e g Hydrology-hydraulics!!

What are then the main ecohydrological adaptation strategies?

Full control of runoff and washoff of soil, nutrients and pollutants, starting with sound forest management of the Pro Silva type in the mountains, with sound water management and water storage when needed

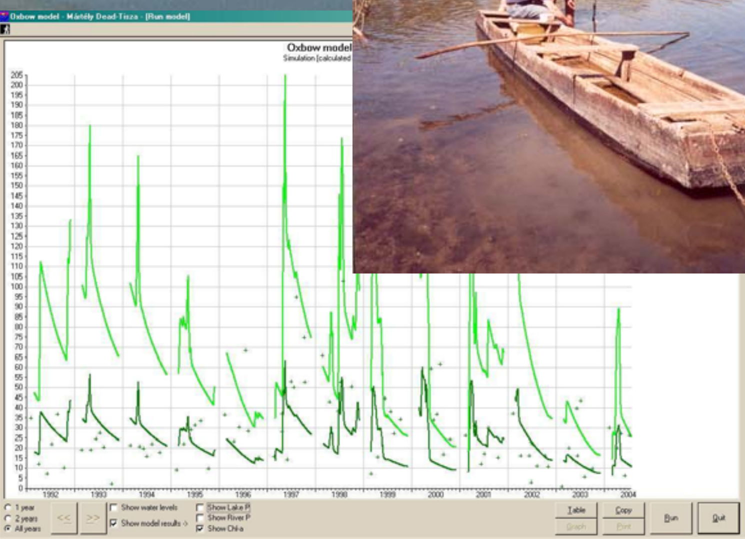
What are then the main ecohydrological adaptation strategies, ctd?

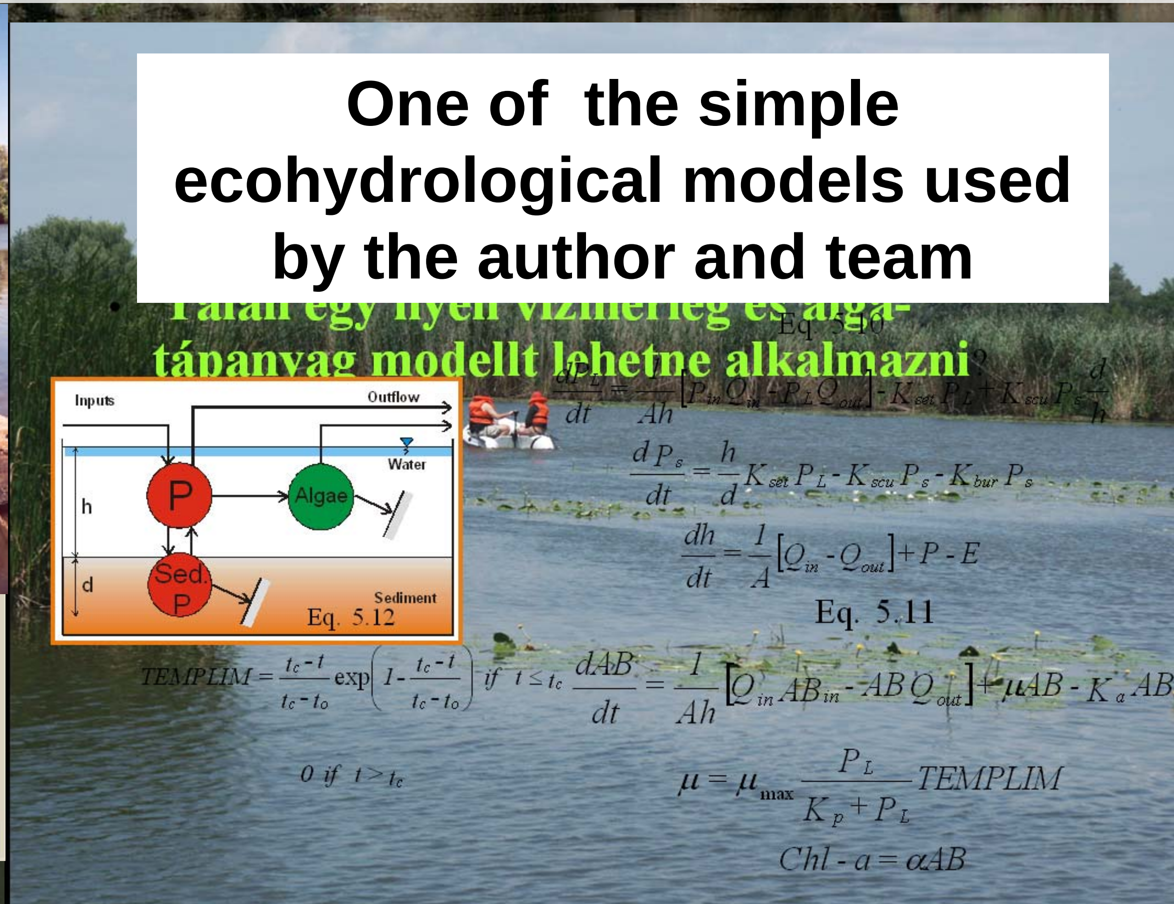
Proper land use management in meadows and agriculture, with proper control of diffuse sources (still in baby shoes in terms of knowledge on their efficiency!!) and with water storage, diversion when so needed (for irrigation and/or drainage, flood control, etc)

Climate ≈ water

What are then the main ecohydrological adaptation strategies?

Last but far not the least the proper ecohydrological management of wetlands, existing and/or recreated for the purpose, also with the help of modelling





One of the simple ecohydrological models used by the author and team

Eq. 5.12

Eq. 5.10

$$\frac{dP_L}{dt} = \frac{1}{Ah}\left[P_{in}Q_{in} - P_L Q_{out}\right] - K_{set}P_L + K_{scu}P_s\frac{d}{h}$$

$$\frac{dP_s}{dt} = \frac{h}{d}K_{set}P_L - K_{scu}P_s - K_{bur}P_s$$

$$\frac{dh}{dt} = \frac{1}{A}\left[Q_{in} - Q_{out}\right] + P - E$$

Eq. 5.11

$$TEMPLIM = \frac{t_c - t}{t_c - t_o}\exp\left(1 - \frac{t_c - t}{t_c - t_o}\right) \text{ if } t \le t_c$$

$$0 \text{ if } t > t_c$$

$$\frac{dAB}{dt} = \frac{1}{Ah}\left[Q_{in}AB_{in} - AB\,Q_{out}\right] + \mu AB - K_a AB$$

$$\mu = \mu_{max}\frac{P_L}{K_p + P_L}TEMPLIM$$

$$Chl\text{-}a = \alpha AB$$