Demonstration scale treatment of drainage canal water in the Nile Delta through a combination of facultative lagoons and hybrid constructed wetlands

Dario Frascari, Ahmed Rashed, Elisa Girometti, Davide Pinelli, Attilio Toscano, Stevo Lavrnić

SUPPLEMENTARY MATERIAL

Fig. S1. Google Earth visualization of the experimental site, including the Baqar Drain, the facultative lagoon, and the 3 CWs operated in parallel.

Fig. S2. Pictures of the floating bed CW (left) and of the sequenced hybrid CW (right)

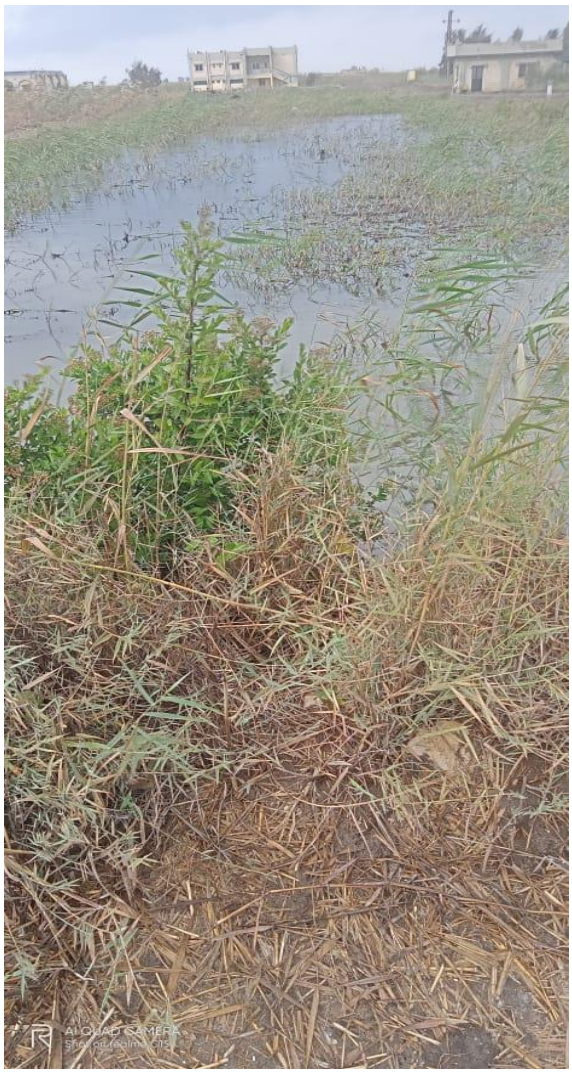

Table S1

Procedure for the calculation of the Spearman correlation coefficient

Relatively to period 1, the potential correlation between temperature and pollutant removal yields in the different FL+CW combinations tested was investigated by means of the Spearman correlation coefficient ρ_s, calculated as follows.

In the first place, the vector **T** was created, containing the water temperatures T_k measured at the FL inlet on the day *k* of each pollutant monitoring (i.e., twice a month). Then, temperatures T_k were ranked from the lowest to the highest, and the vector **rankT** was created, containing the ranks $rankT_k$ (k=1, 2, …., n) of the temperatures contained in vector **T**.

Similarly, for each pollutant *i* (COD, BOD, TSS, Total Nitrogen, Faecal Coliforms or phosphates) and for each FL+CW combination *j* (FL+CHCW, FL+SHCW, FL + FBCW), the vector $\mathbf{RY_{i,j}}$ was created, containing the removal yields $RY_{i,j,k}$ calculated for each pollutant *i* and for each FL+CW combination *j* on each day *k* of monitoring (i.e., twice a month). $RY_{i,j,k}$ were calculated according to Eq. (1), section 2.4. Then, removals $RY_{i,j,k}$ were ranked from the lowest to the highest, and the vector $\mathbf{rank\ RY_{i,j}}$ was created, containing the ranks $rankRY_{i,j,k}$ (k=1, 2, …., n) of the removals contained in vector $\mathbf{RY_{i,j}}$.

Lastly, the Spearman correlation coefficient $\rho_{s,i,j}$ was calculated as follows:

$$\rho_{s,i,j} = \frac{\sigma_{T,RY_{i,j}}}{\sigma_T \cdot \sigma_{RY_{i,j}}}$$

where:

$\sigma_T = \sqrt{\frac{\sum_{k=1}^{k=n}(rankT_k - AV_{rankT})^2}{n}}$, where AV_{rankT} indicates the average of the temperature ranks;

$\sigma_{RY_{i,j}} = \sqrt{\frac{\sum_{k=1}^{k=n}\left(rankRY_{i,j,k} - AV_{rankRY_{i,j}}\right)^2}{n}}$, where $AV_{rankRY_{i,j}}$ indicates the average of the removal yield ranks;

$\sigma_{T,RY_{i,j}} = \sqrt{\frac{\sum_{k=1}^{k=n}(rankT_k - rankRY_{i,j,k})^2}{n}}$

The correlation coefficients relative to period 2 were calculated according to the same procedure.