Integration of wetland wastewater treatment with disinfection via bio-electrochemical H$_2$O$_2$ production

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Conventional decentral Wetland WasteWater treatment:

WasteWater; Domestic or Agricultural

Wetland treatment
COD & nutrient removal

Discharge to Surface water

Conceptually new decentral Wetland WasteWater treatment:

Solar Cell for Power Input

Anode Respiring Bacteria

BES-Anode
Main stream: Soluble COD $\rightarrow$ current

Potentiostat

CO$_2$ $\rightarrow$ e$^-$

H$^+$

BES-Cathode
Side stream: current $\rightarrow$ H$_2$O$_2$

Wetland treatment
Solids & nutrient removal + EXTRA COD due to rhizodeposition & exudation

- Good stable performance in Spring & Summer
- Limited COD and nutrient removal during colder periods
- Passive disinfection

- Anode as 2nd treatment when wetland performance is less
- Plants provide extra soluble COD for the anode
- Side stream cathodic concentrated H$_2$O$_2$ as an active disinfectant before reuse or discharge
- Year-round use of solar power input