

Free surface constructed wetland with recirculation using photovoltaic pump for domestic wastewater treatment: the first full-scale system in Cyprus and its potential in Mediterranean

Dr Ioannis Vyrides

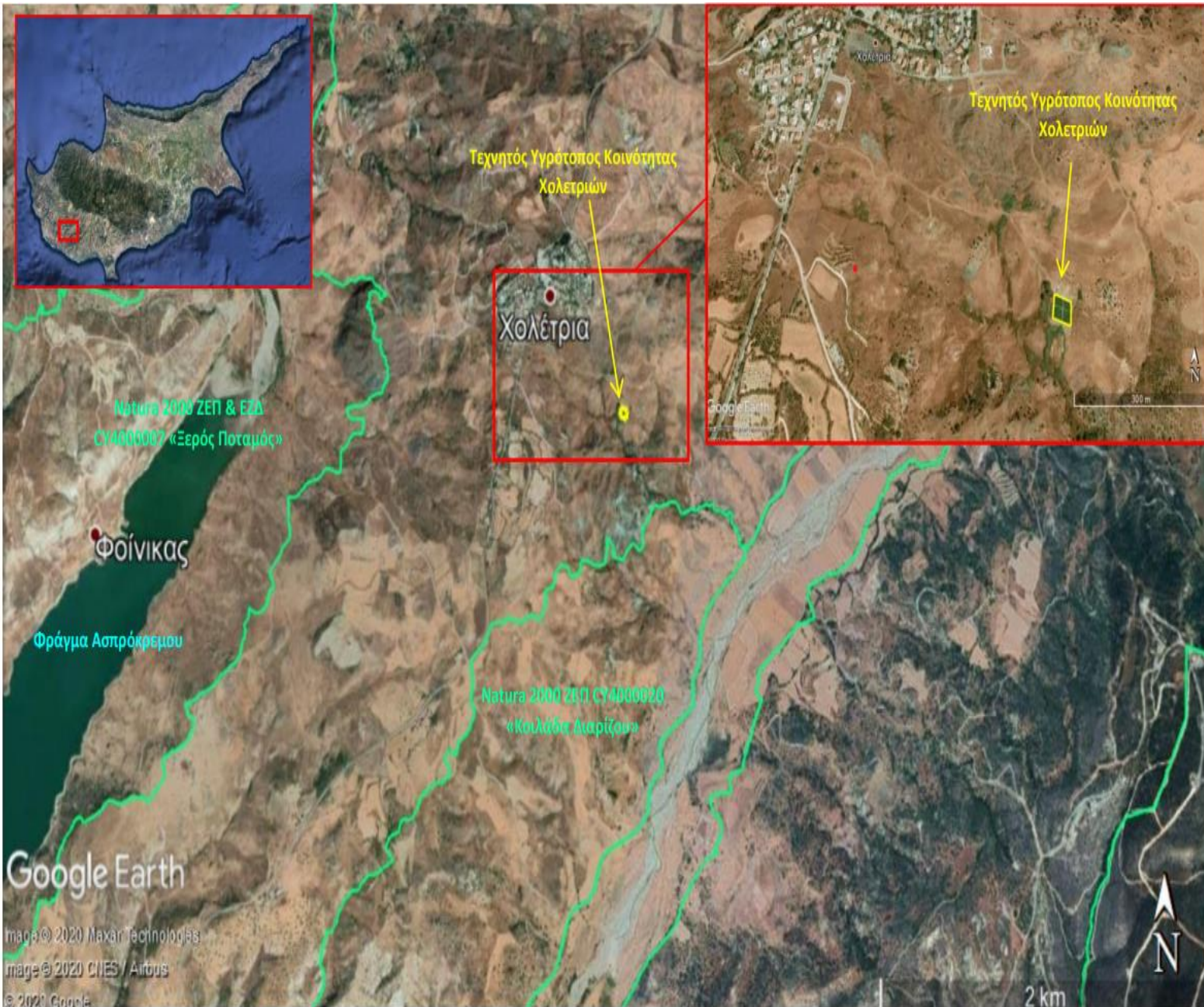
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Cyprus
University of
Technology

9th of November, Paphos
SDEWES2022



Choletria WWTP prior Upgrading , Not working and the wastewater was discharged to the environment



Choletria WWTP prior Upgrading , Not working and the wastewater was discharged to the environment



DOMUS_CW project



DOMUS

Optimisation of decentralized DOMestic wastewater treatment and sanitation via constructed wetlands

Interreg V-B "Balkan-Mediterranean 2014-2020"

European Regional Development Fund (ERDF)

September 2017- November 2020

LP: Institute of Chemical Engineering Sciences

PP2: Municipality of Andrichaina/Krestena

PP3 : Cyprus University of Technology

PP4: Development Agency of Paphos, Afrodite Ltd

PP5: Agricultural University of Tirana

OP: Institute of Environment and Sustainable Development

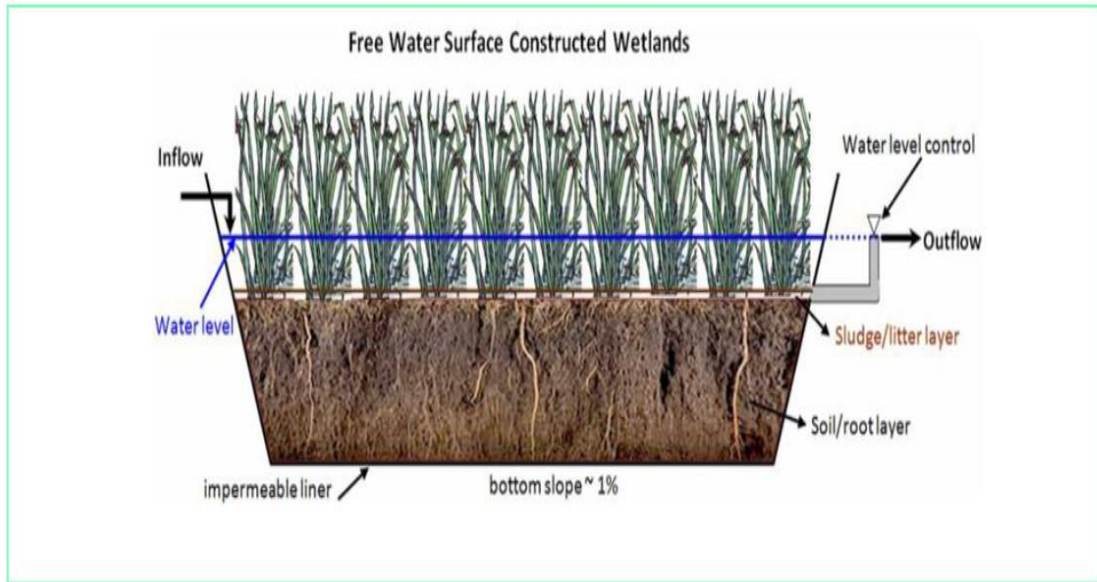


Figure 3. Free water surface CWs schematic representation

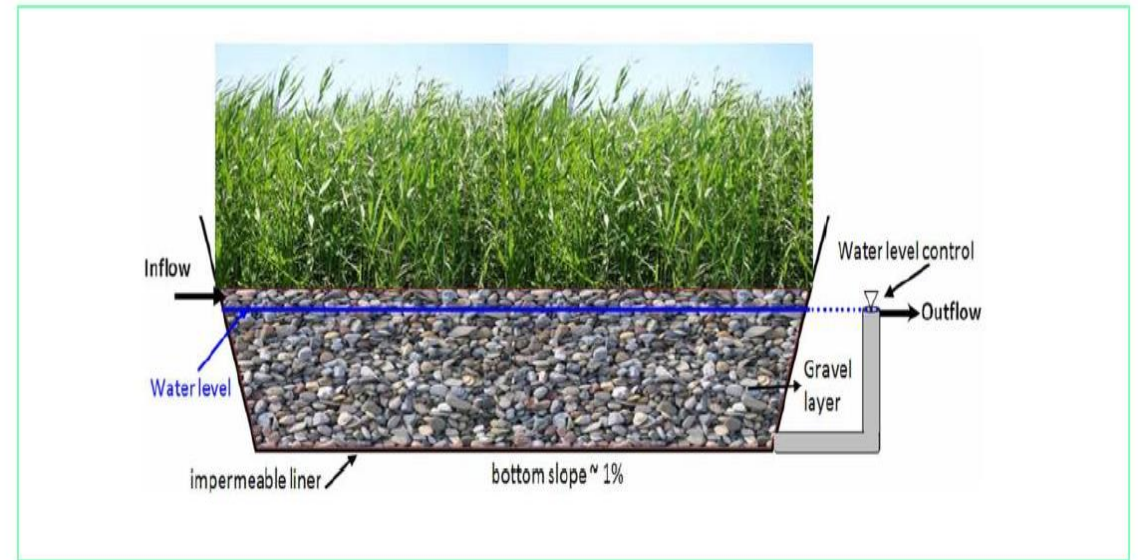


Figure 4. Horizontal Subsurface Flow CWs schematic representation

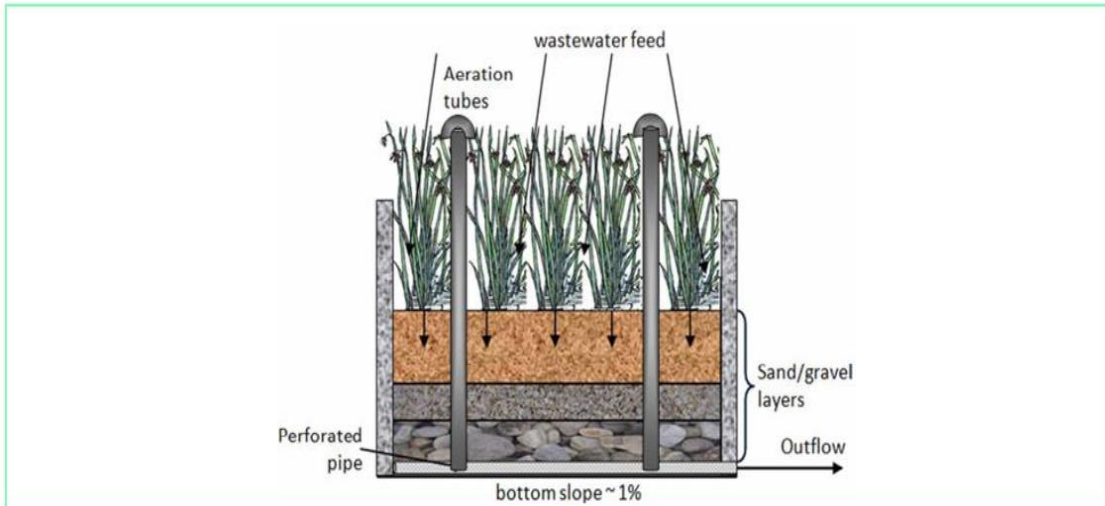


Figure 5. Vertical Flow CWs schematic representation

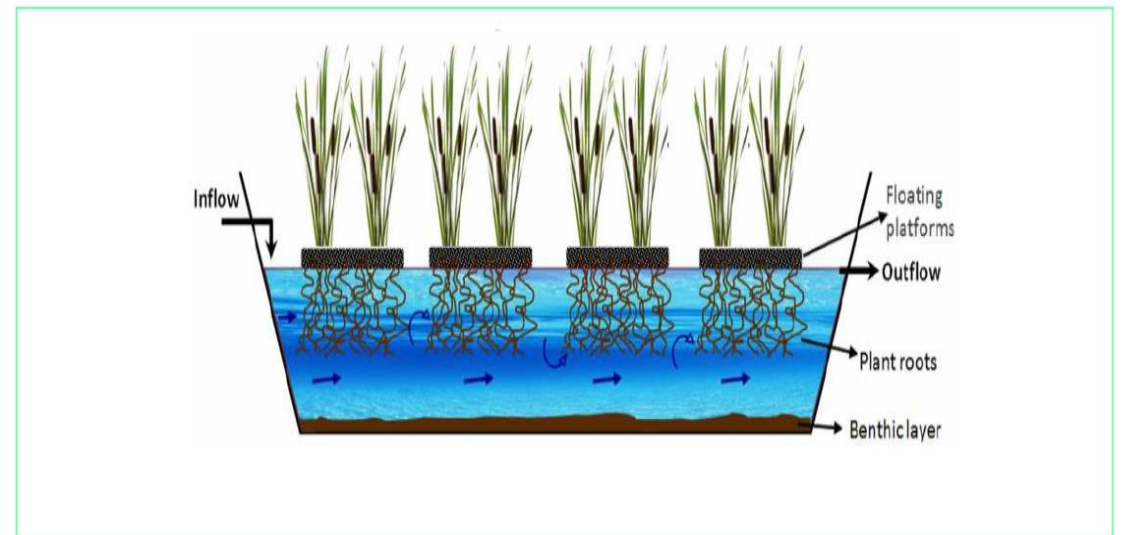
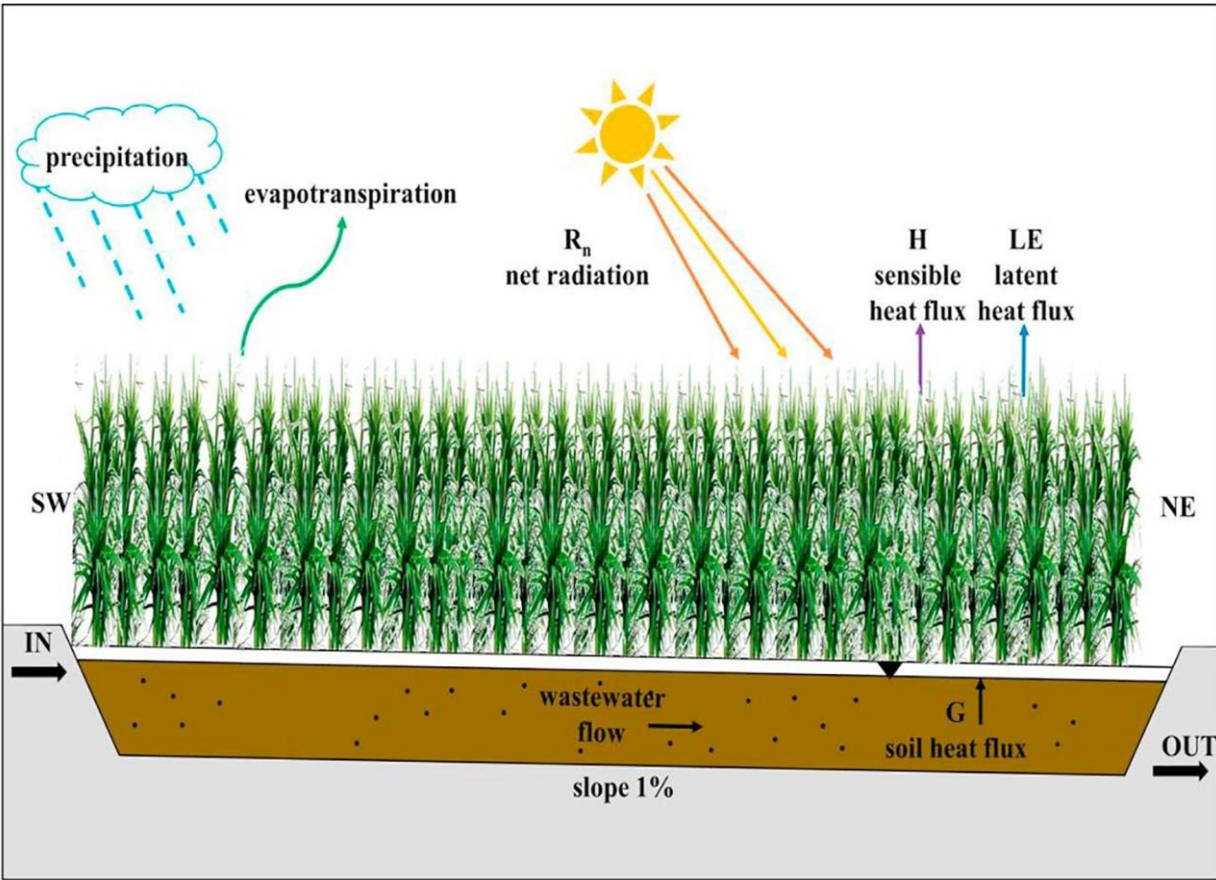
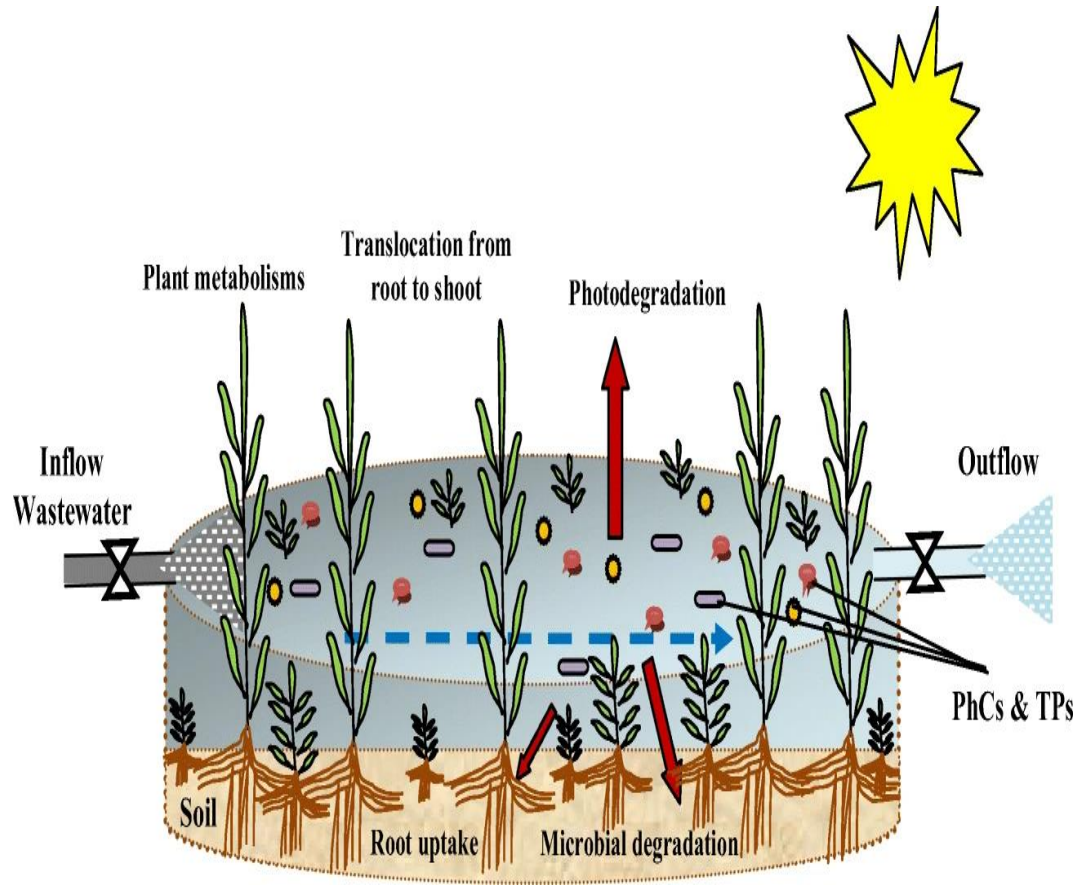


Figure 6. Floating Treatment schematic representation

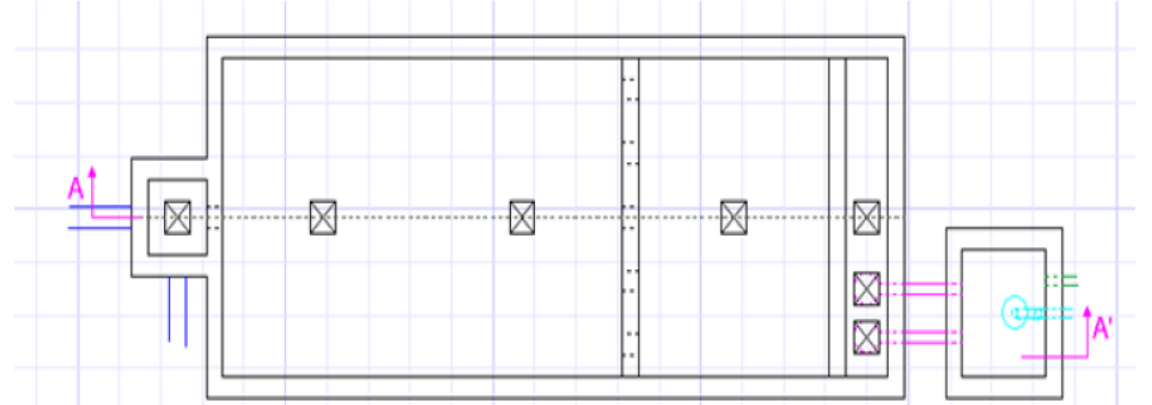
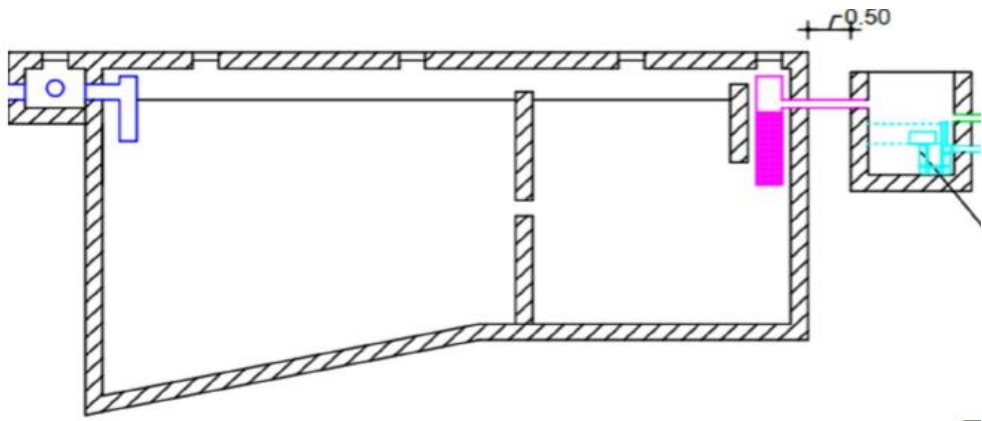
Free surface Constructed wetlands (CW)



Mechanisms for pollutant Removal

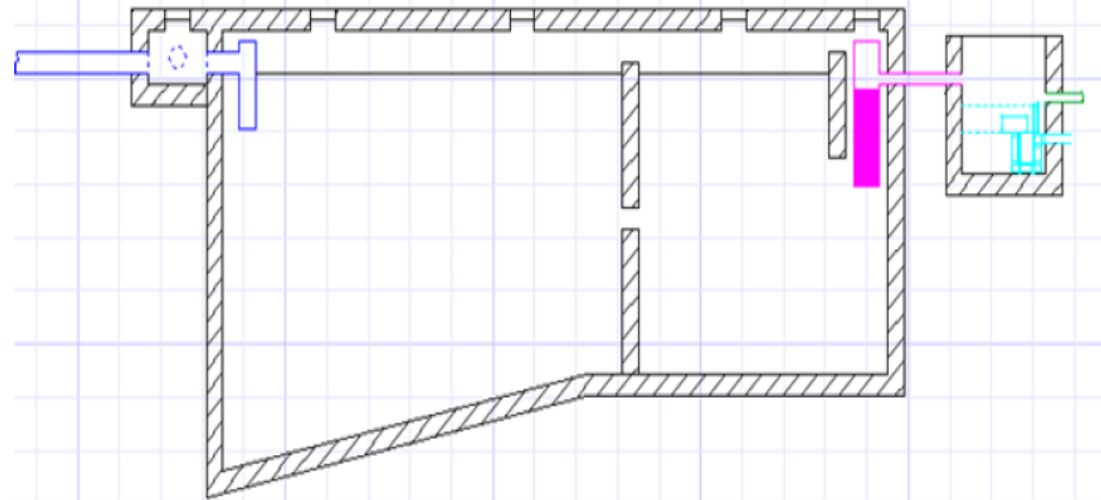






ΣΗΠΤΙΚΗ ΔΕΞΑΜΕΝΗ

ΦΡΕΑΤΙΟ
ΦΟΡΤΙΣΗΣ



November 2019







Upgrading – November 2019

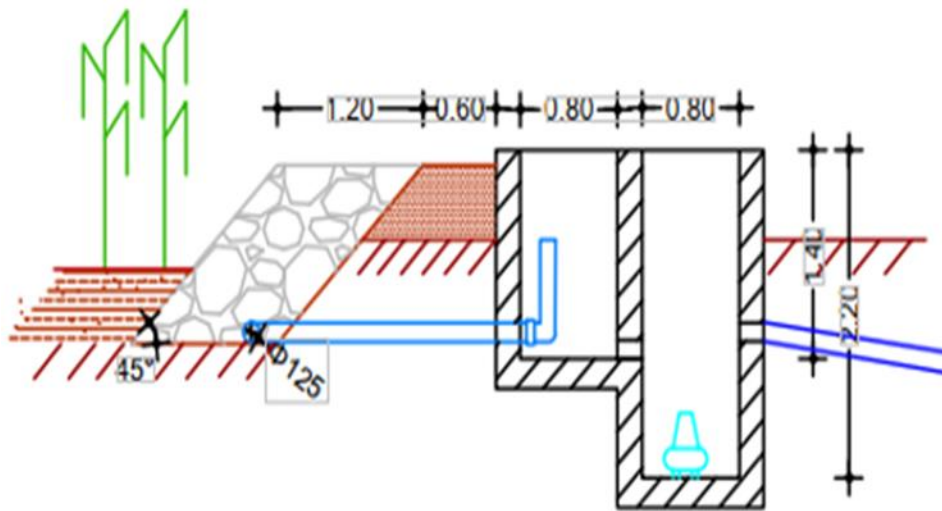




Effluent



Control of the level of the water in the wetland



ΛΕΠΤΟΜΕΡΙΕΣ
ΤΟΜΗ Β-Β'









December 2019



Reeds: *Phragmites Australis*









December 2019



March 2020





March 2020



April 2020





May 2020



June 2020



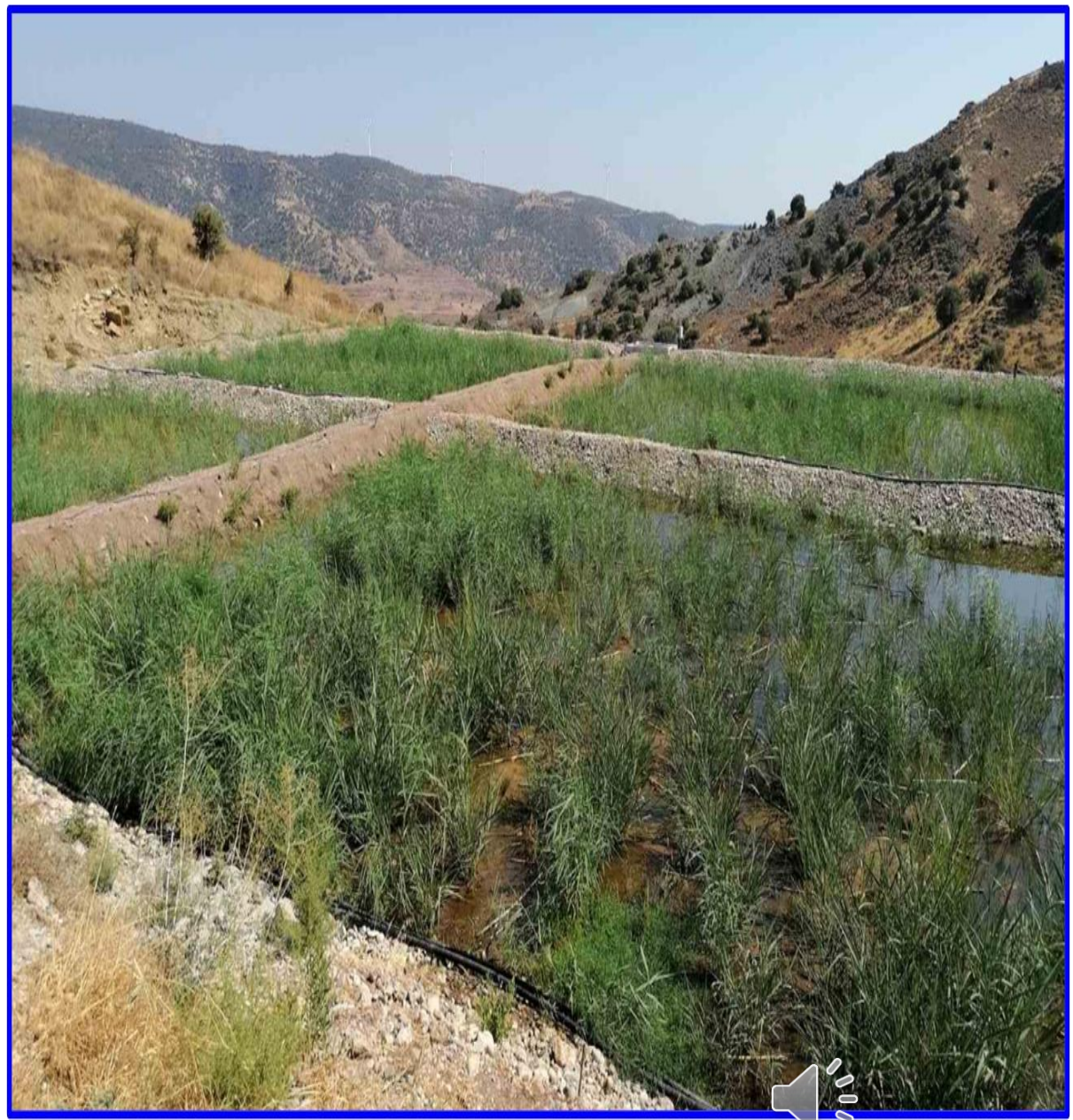
End of June 2020



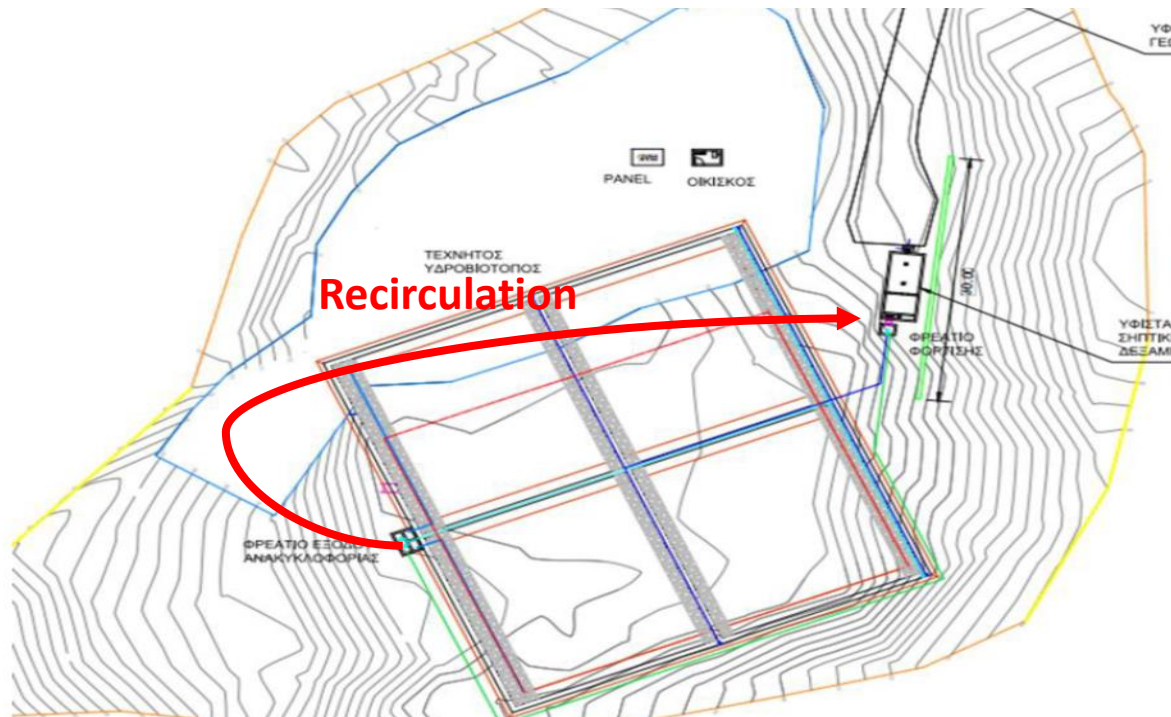
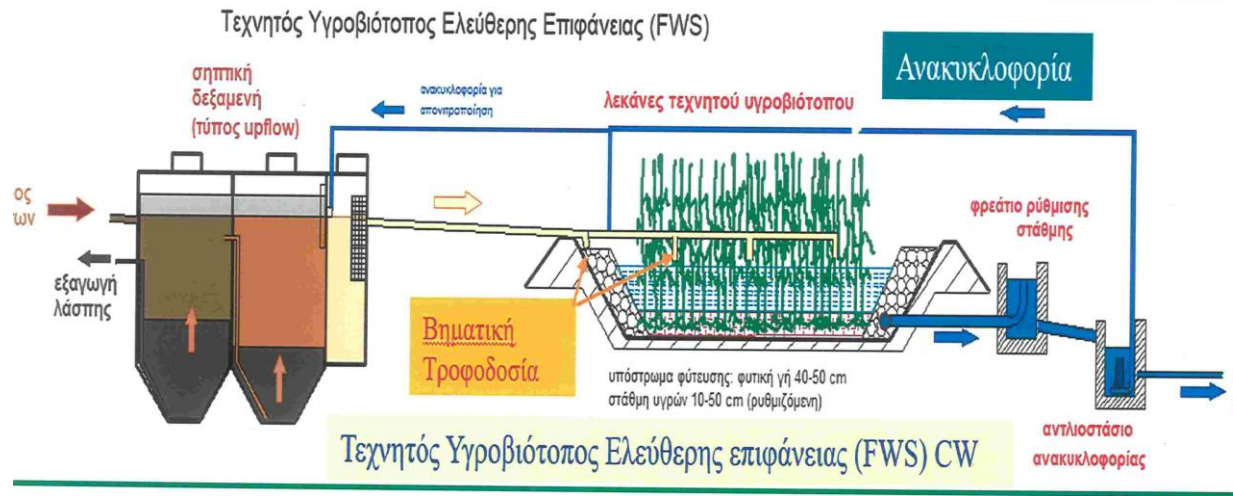
End of June 2020



July 2020



Installation of recirculation using photovoltaic pump







August 2020

August 2020



September 2020

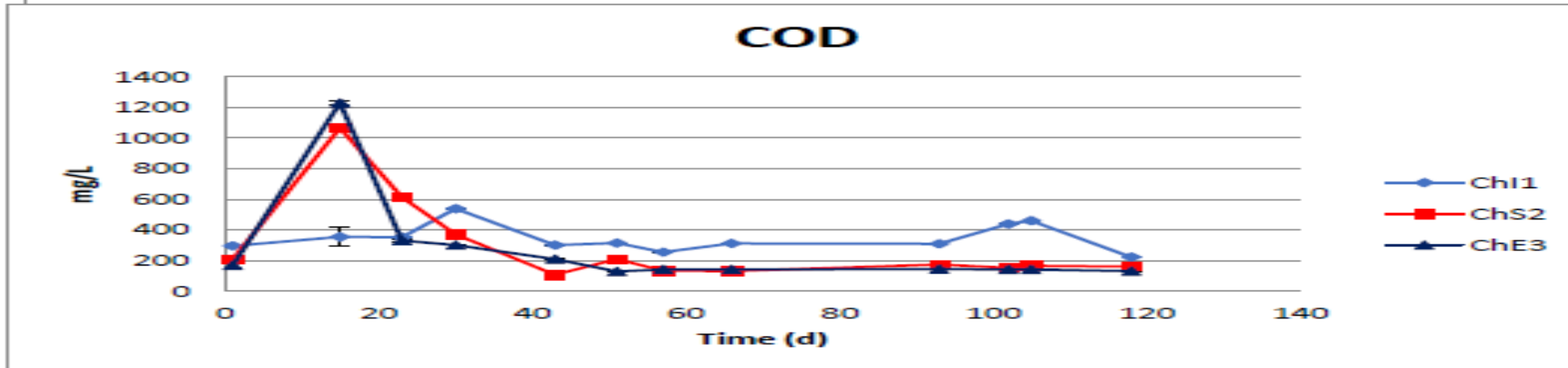
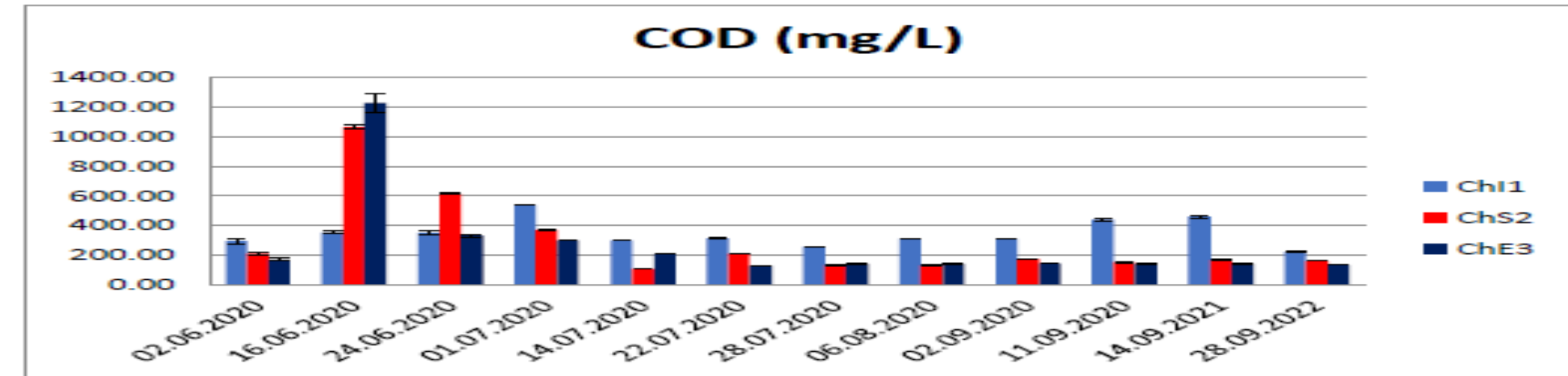


Figure 32 COD charts over time

ChI1= inlet wastewater

ChS2= After septic tank

ChE= Effluent from Constructed Wetland

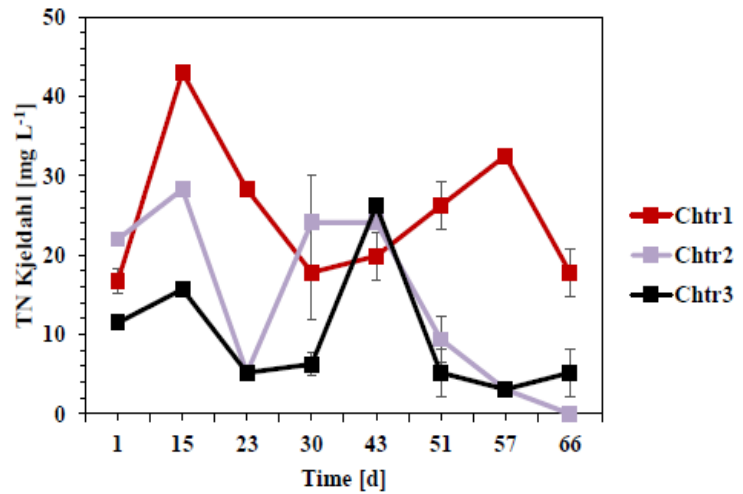


Figure 14. TKN values of the three sampling points taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.

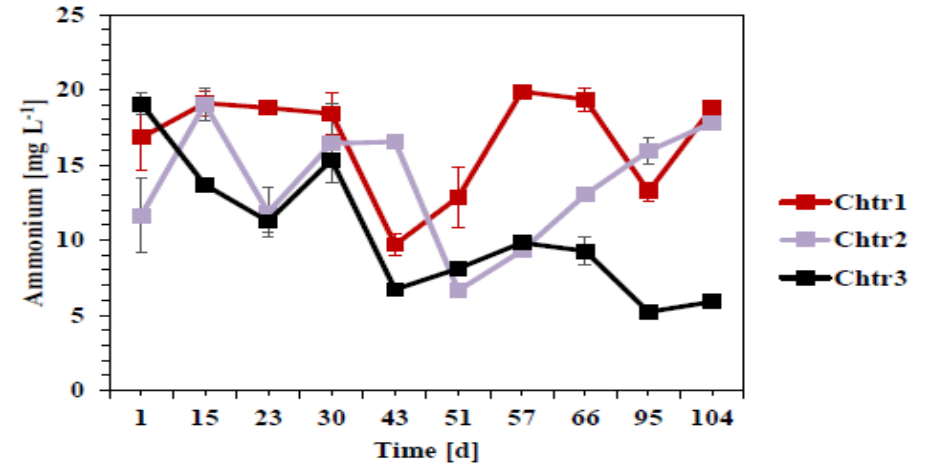


Figure 15. NH_4^+ values of the three sampling points taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.

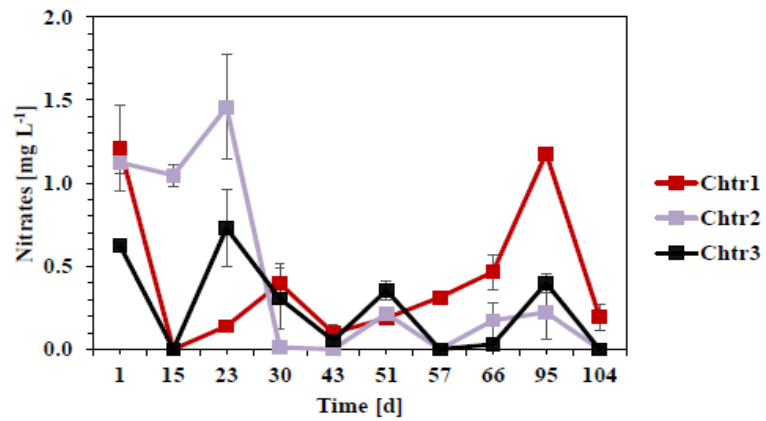


Figure 16. NO_3^- values of the three sampling points taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.

ChI1= inlet wastewater
 ChS2= After septic tank
 ChE= Effluent from Constructed Wetland

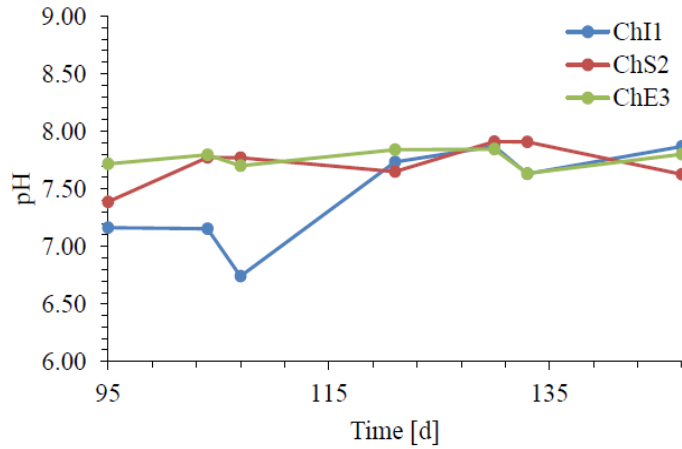


Figure 20. pH values for the inlet, septic and outlet sampling points taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.

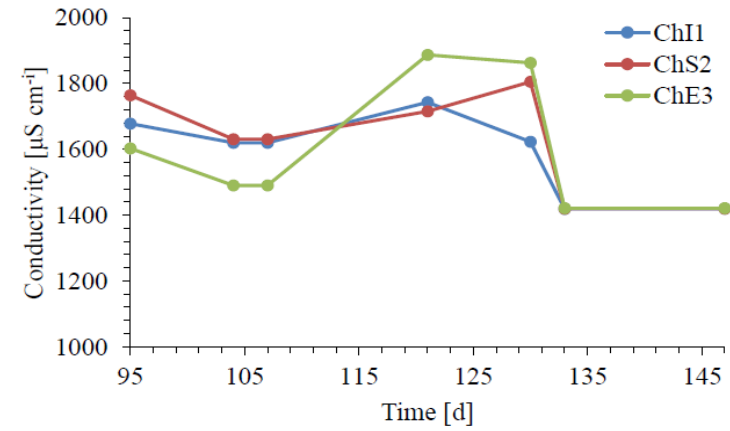


Figure 21. Conductivity values for the inlet, septic and outlet sampling points taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.

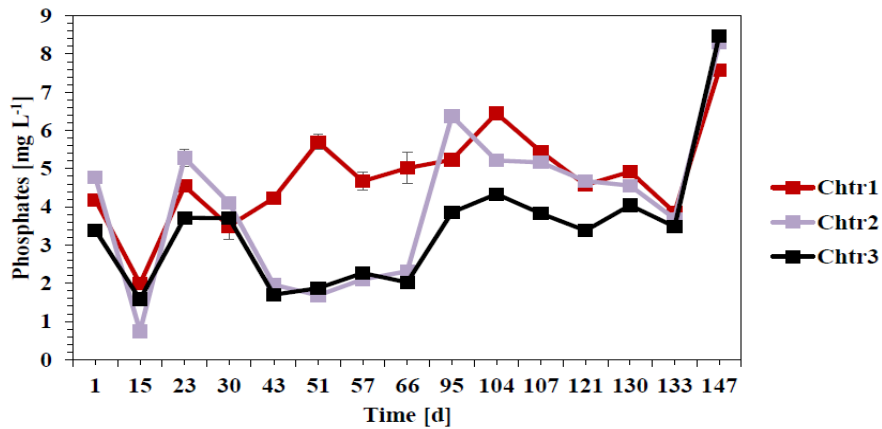


Figure 27. PO_4^{3-} values of the three sampling points taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.

ChI1= inlet wastewater

ChS2= After septic tank

ChE= Effluent from Constructed Wetland



Phytotoxicity determination of wetland samples in *Sinapis alba* seeds

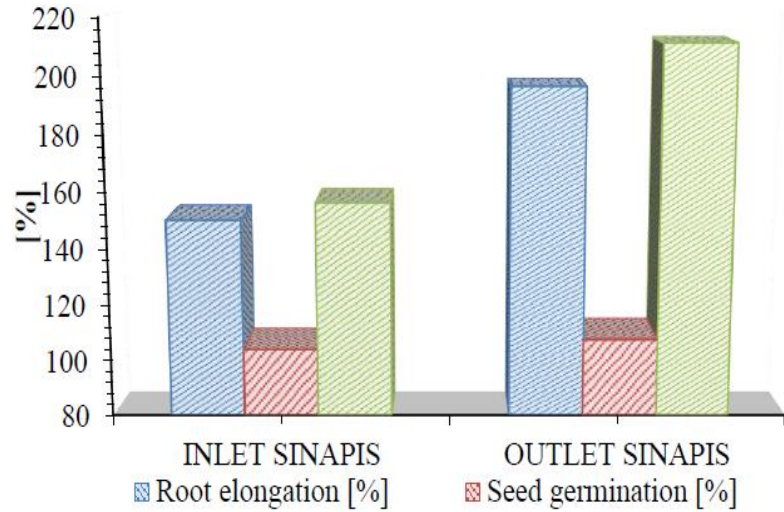
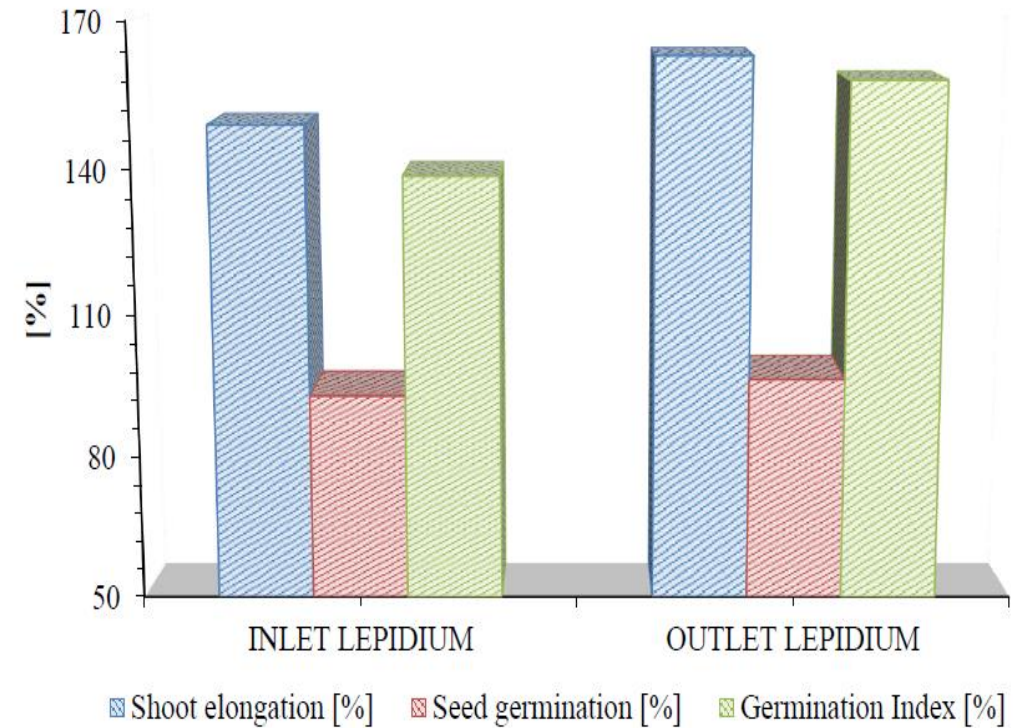
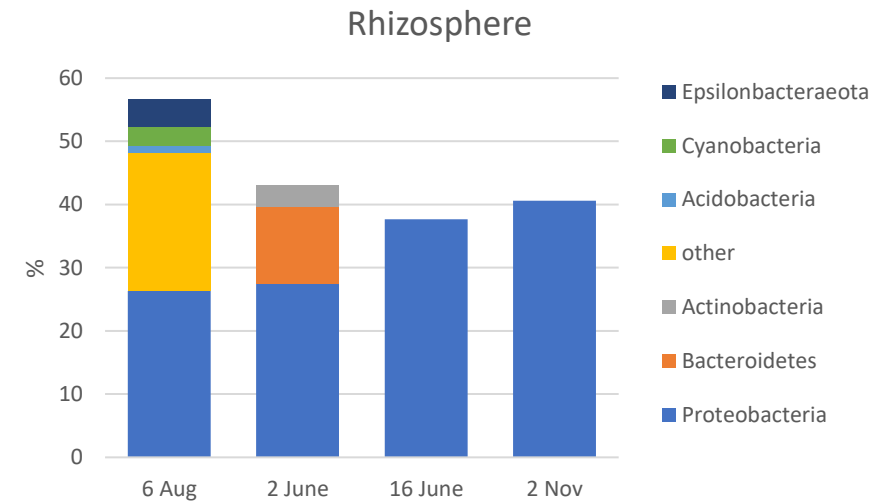
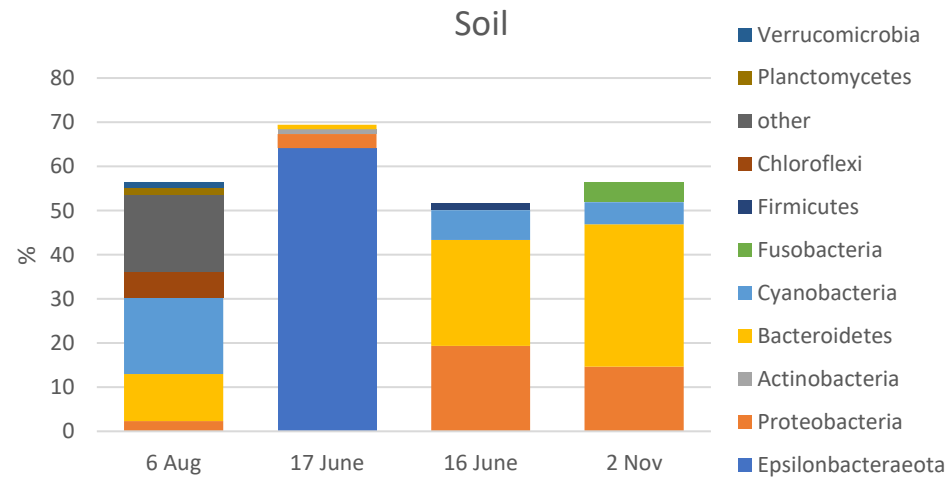
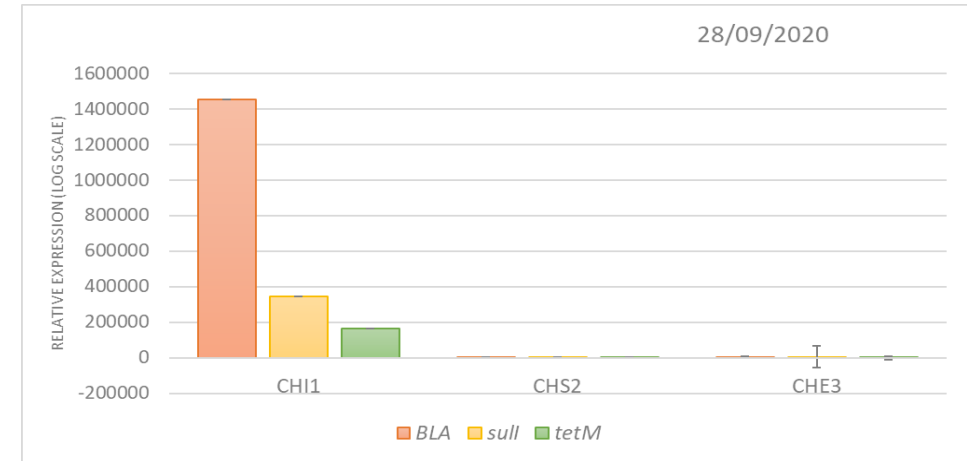


Figure 15. % of root elongation, seed germination and germination index of *Sinapis alba* for the inlet and outlet sampling point taken from the free surface constructed wetland (FSCW) in Choletria, Paphos.



The tested antibiotic resistant genes cannot be detected in the effluent.

Antibiotic resistance	
Tetracycline :	<i>tetM</i>
Sulfmine :	<i>SulI</i>
Amoxicillyn :	<i>bla</i>



Microbial profile over time from the soil and Rhizosphere

Monitor flora and fauna of the area





Εκδήλωση επίδειξης Φυσικού Συστήματος Επεξεργασίας Αποβλήτων Τ...

The national TV covered the opening ceremony of the project

<https://www.facebook.com/CyprusUniversityTechnology/videos/658595481407901>

The national Portugal TV showed the DOMUS project; as part of a TV show that presents the best practices of European Projects in each country with the highest impact on society.

<https://www.rtp.pt/play/p8717/e579198/de-lisboa-a-estocolmo>



Εκπομπή "Σπίτι στη γούσα"

A program was dedicated to this project by the national TV in Cyprus
https://www.youtube.com/watch?v=91EtG_q3xTE



Conclusions

- 70-80 % COD removal
- 90% BOD removal
- 40% Total Phosphorous removal
- 80% Ammonia removal
- 70% Nitrate removal
- Effluent less toxic than the influent based on phytotoxicity testing



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Conclusions : Solution for remote communities in Mediterranean







Thank you!



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