

# Piloting Water Reuse for Shrimps Farms in context to the implementation of IWRM

Nguyen Van Long, Dr. G. Walenzik, Prof. Dr.mult. K.-U. Rudolph

## Introduction

This presentation is held under the project “IWRM DaMe”, funded under the South East Asia-Europe joint funding scheme.

Technical information and outcomes of other R&D projects sponsored under the German and Vietnamese Ministries are utilized for this presentation.

The IEEM team would like to thank the EC, the BMBF and MOST Vietnam for the great support of these research-projects. On behalf of our Bulgarian partner team under Prof. Aitchkov, IEEM would also like to thank the BNSF funding and this having made the IWRM-DaMe project come true

Shrimp farming is a rapidly growing sector. It is among the most important providers of jobs and welfare in the Mekong Delta, but also a large water consumer and a harmful source of pollution



Aerial photo Ca Mau province



Shrimp farm operations Ca Mau

- Shrimp farms are causing water pollution and suffering from water pollution

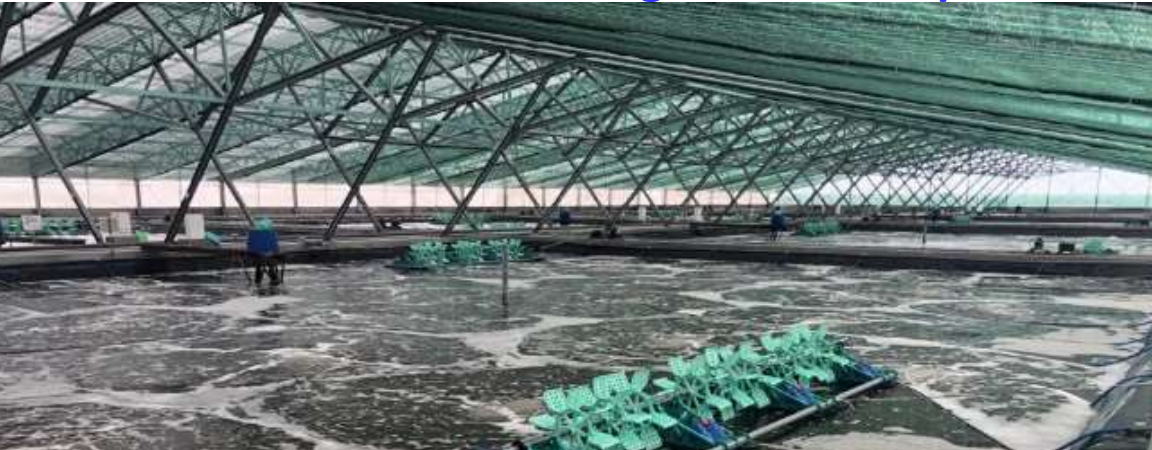
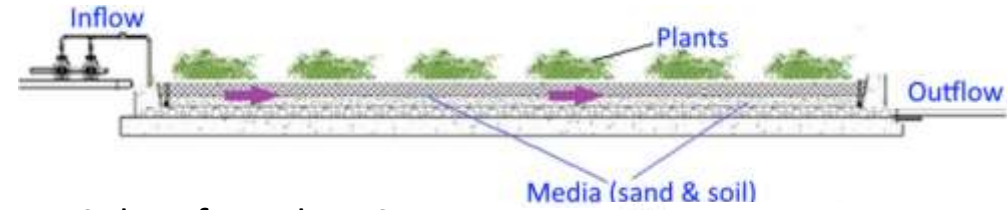


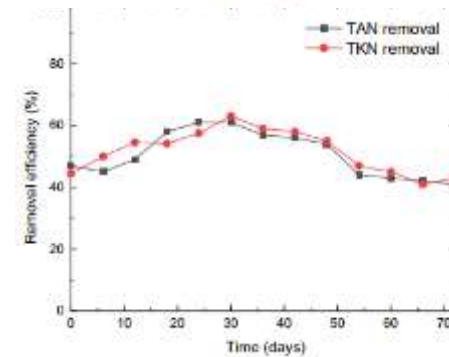
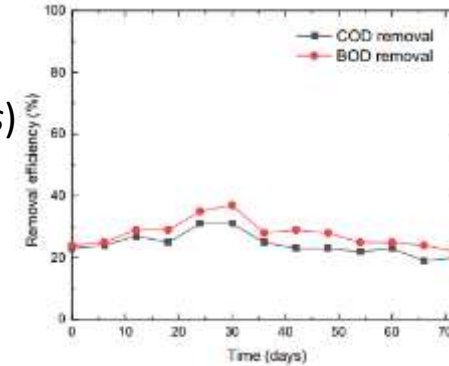
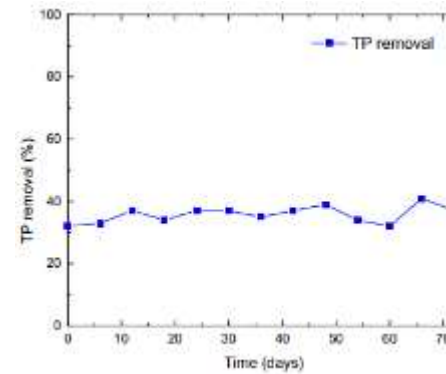
Table 1 Pollution level of the inflow water of the CW

Entry	Parameter	Concentration (unit)
1	Turbidity	48.3 ± 24.6 NTU
2	Salinity	16.2 ± 2.9 PSU
3	Dissolved oxygen	5.2 ± 1.7 mg·L <sup>-1</sup>
4	TAN	5.6 ± 0.7 mg·L <sup>-1</sup>
5	TKN	7.6 ± 1.9 mg·L <sup>-1</sup>
6	COD	106 ± 14 mg·L <sup>-1</sup>
7	BOD	49 ± 4.2 mg·L <sup>-1</sup>
8	TP	12.1 ± 2.9 mg·L <sup>-1</sup>
9	Fe	0.71 ± 0.23 mg·L <sup>-1</sup>

- Solutions up to VN A effluent standard:  
Floating plants or reed-beds  
Water reuse needs advanced post treatment



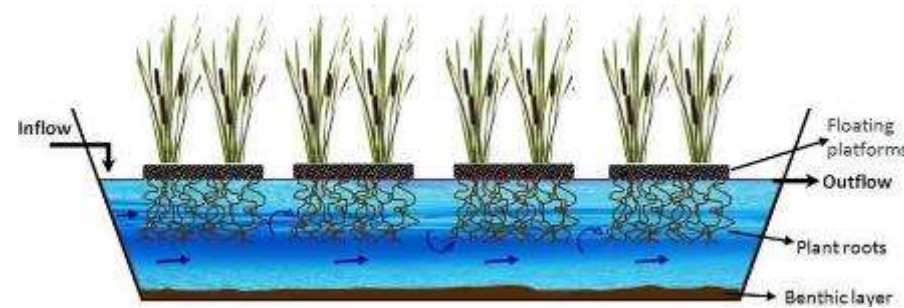
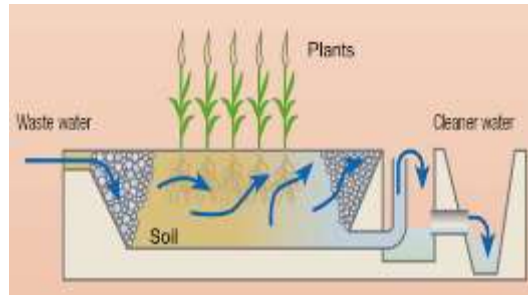
- Subsurface Flow CWs
- Bulrush (*Scirpus littoralis*)
- Cypress (*Cyperus involucratus*)
- Seagrass (*Posidoniaceae*)



H.Q.A. Le, T.N. Dinh, D.T. Phan, M.P. Nguyen, N.N. Pham, V.L. Nguyen, K.-U. Rudolph, J. Hilbig, Treatment of shrimp farm effluents using a combination of native plant species in the Mekong Delta region. *Int. J. Environ. Sci. Technol.* (2022)

## Prestudy for biological wastewater treatment before advanced purification have considered various technologies which can be applied in existing shrimp farm ponds (eart tanks)

- **Low cost, nature-based technologies**
  - VN Standard (QCVN 01-80:2011/BNNPTNT & 10-MT/2015/BTNMT) to be complied with; „Constructed Wetlands“ und „Floating Wetlands“ preferred by the Vietnamese researchers



- **Affordable and cost-efficient for more stringent requirements**



CWSBR ,  
continuous  
waterlevel  
sequencing  
batch reactor  
([www.g-a-a.de/en/](http://www.g-a-a.de/en/))

## Pilot plants for biological wastewater treatment have verified the function, after some failures.



ABOVE: plants, which could not stand the draught and high salt contents.  
LEFT: Plants finally selected and handled appropriately

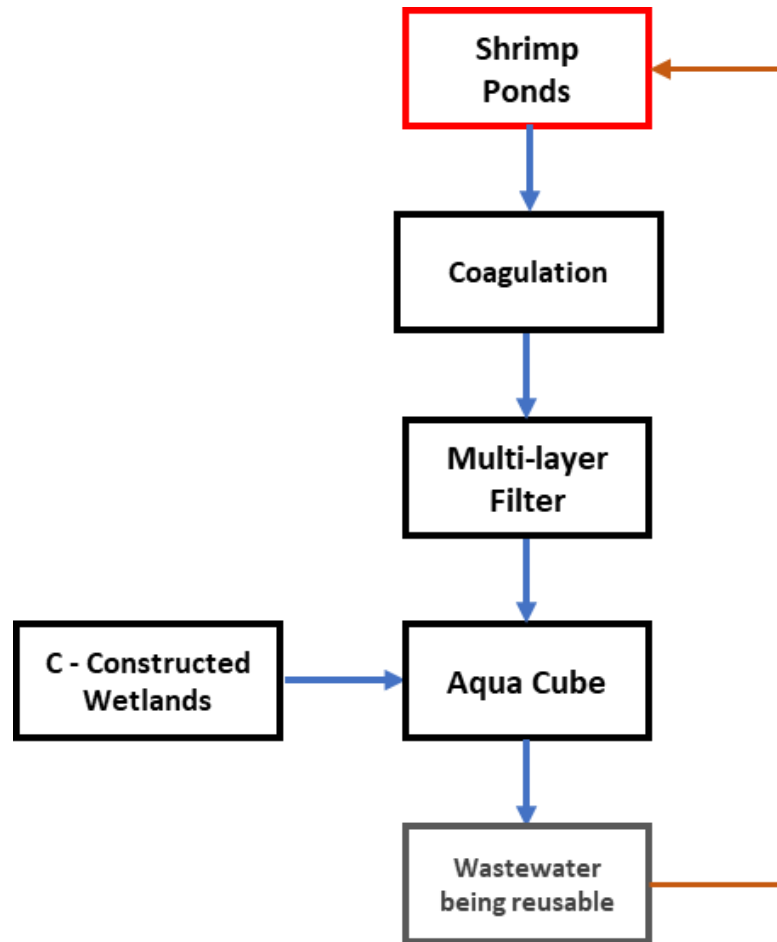
The core technological component for advanced wastewater purification, like for shrimp farm water reuse, is ultrafiltration,



3 UF Modules developed and built by IEEM-partner Wilo-Martin Systems in Germany are assembled (left) and received at CERWASS in Ca Mau

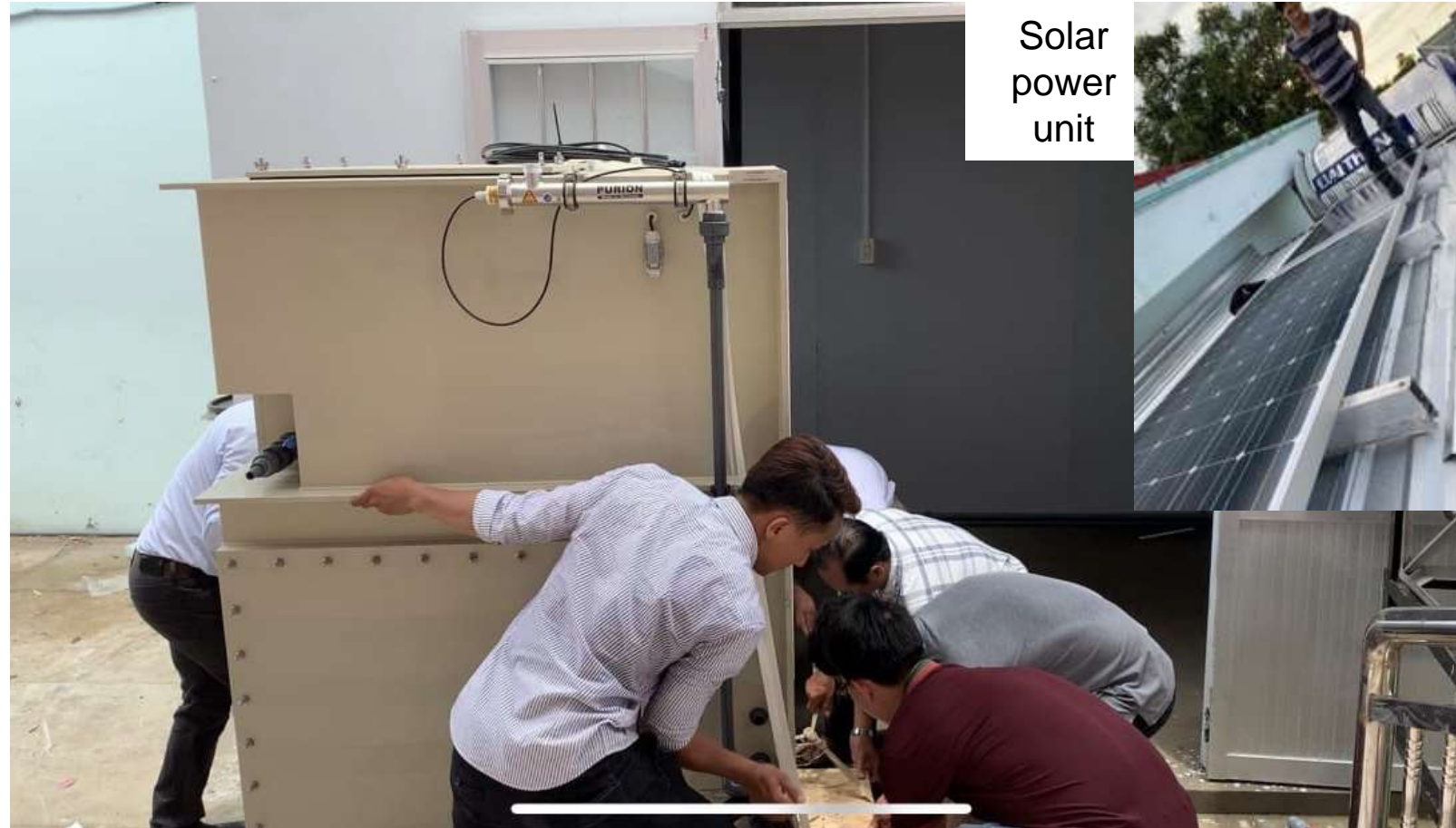


**As second option to floating plants, a chemical-mechanical pre-treatment was tested before the Aquacube**





After the completion of pilot plant tests at the shrimp farm, the UF module was moved to treat contaminated surface water from a canal and contaminated groundwater



Plant buildings with mechanical pre-aeration (Fe, Mn) and pre-filters (sand to reduce SS) and storage tanks are needed.



Local users and project partners inspect the connection pipe and installations around the pilot plant

Non-potable water is distributed through the house (or shrimp farm) network and can be taken from outside tap, drinking water (which must desalted behind the UF in a RO, reverse osmosis, during dry season) is provided only for small quantities on demand at the stainless-steel sink outside the plant house. RO is not needed during rainy season, and then only for ca. 20 % of total water consumption. The technology of this micro-supply water plant is suitable for a shrimp farm, using non-potable water for re-fill of shrimp ponds and potable to supply the staff on site.



**Dual Water  
Production:  
Non-potable  
and  
Potable water**

## One of various IWRM technology training workshops and pilot plant performance monitoring campaigns, supported by IEEMs mobile lab

From the four pilot plant locations, there are three communities and one industry (shrimp farm) who have been involved as twinning partner for WRM implementation under the IWRM-DaMe project



## Conclusion

- **Water scarcity** is a problem not limited to arid regions or drought periods, it is a problem, already and increasingly, in water rich areas wherever the natural water resources are contaminated.
- **Sources of contamination** are pollution from wastewater and run-off, but also from natural sources, like salt or arsenic in certain areas.
- **All kind of water resources** may be affected, surface water, groundwater and even rainwater (in case of air pollution like from coal power plants, industry, traffic or house heating with sulfuric brown coal).
- **Dual water production** makes sense in a complex, difficult environment - be it for shrimp farm or small settlements in abandoned areas of the Mekong Delta or elsewhere.
- **Process monitoring and control** must be sophisticated, because the seasonal change and water shortages may make it necessary to feed the water purification plant with different raw water sources (like, in the case presented here, surface-, ground- and rain-water).
- **New technologies are available** to purify the water, and technical progress has made these more affordable than in the past decades. Herefore, the UF is definitely a good example. The demand for workable technology-based solutions will increase, as the water demand in DaMe is growing.
- Without IWRM implementation to enforce illegal pollution, over-exploitation and durable O&M on river basin scale, the technical and financial requirements for all purification technologies will increase. **With better IWRM implementation, much less would be needed.**

# Thank you for your attention

If you have further question please do not hesitate to contact the IEEM-Team under  
[mail@uni-wh-ieem.de](mailto:mail@uni-wh-ieem.de)