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MICRO-ECOLOGICAL LIFE SUPPORT SYSTEM ALTERNATIVE

CREATING A CIRCULAR FUTURE

Grey Water Re-use During Music Festivals Using a Mobile Constructed Wetland and a Mobile Drinking Water System

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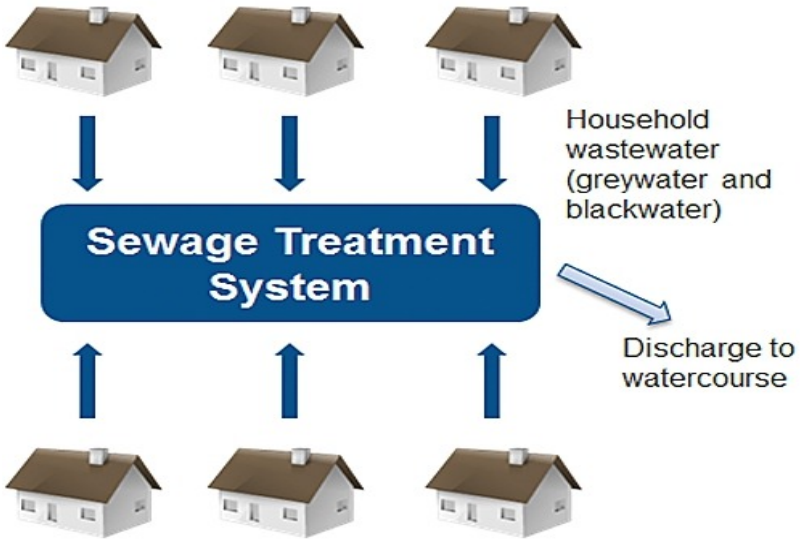
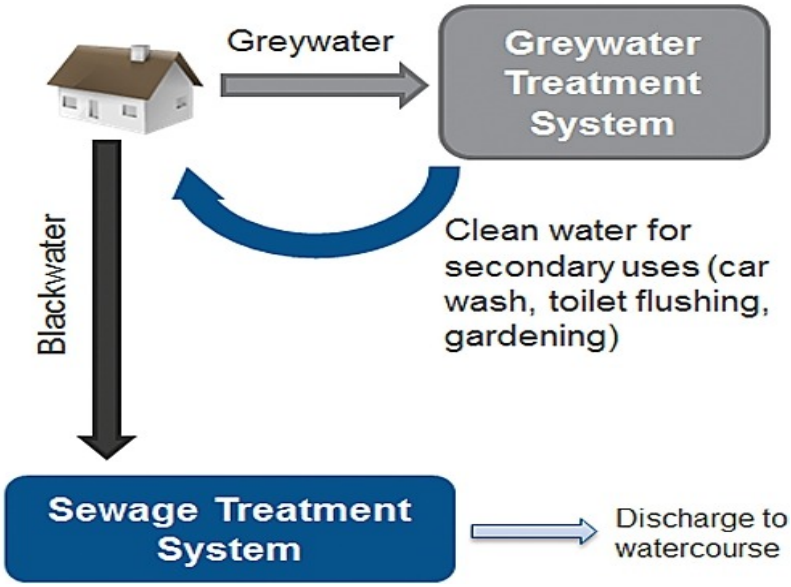
(De)centralized water treatment

- Centralized system



- Decentralized system



Source: Leong et al., (2018)

Introduction

Festivals in Belgium (2017-2019):

- Ieperfest
- Boomtown
- Paradise city
- Dranouter

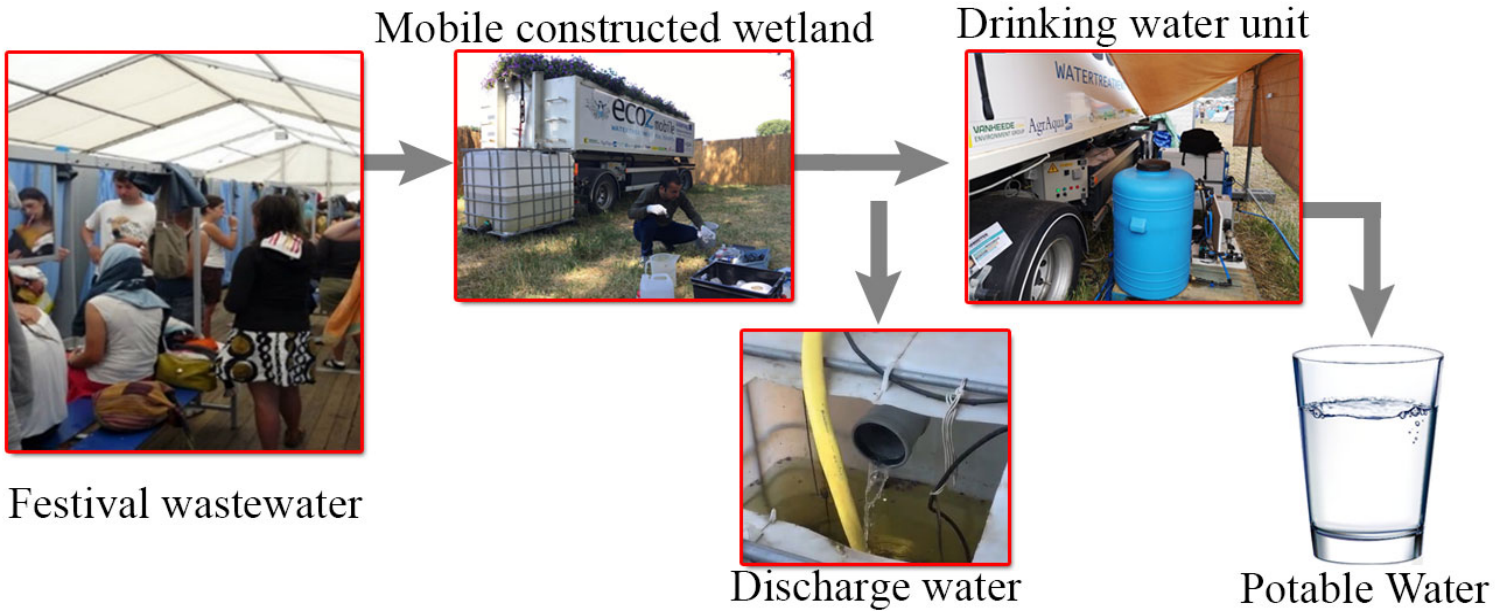
Objectives:

- Decentralized water treatment
- Grey/black water treatment and reuse
- Nutrient recovery from wastewater

Objectives

1. Design of the mobile constructed wetland (MCW)
2. Development phase: tested with greywater (GW) at festivals 2017-2018 *(Ieperfest, Boomtown, Paradise city & Dranouter)*
3. Challenging test to determine hydraulic loading rate with domestic wastewater
4. Performance test at festivals 2019 *(Paradise city & Dranouter)*

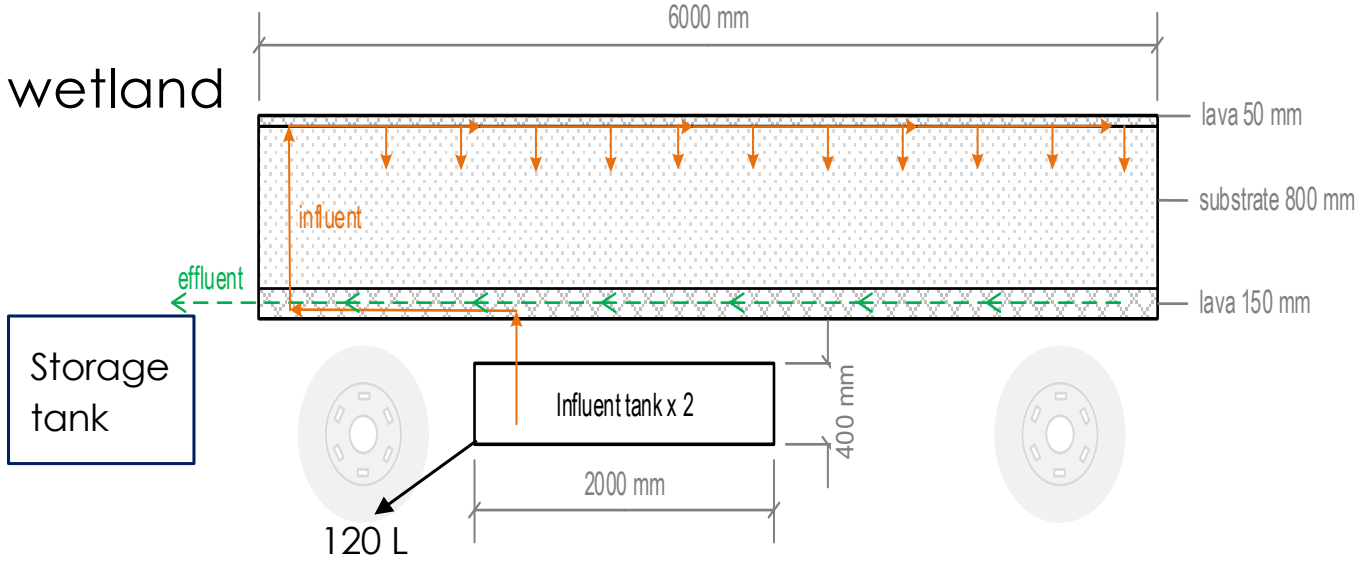
MCW & drinking water system at festivals 2019



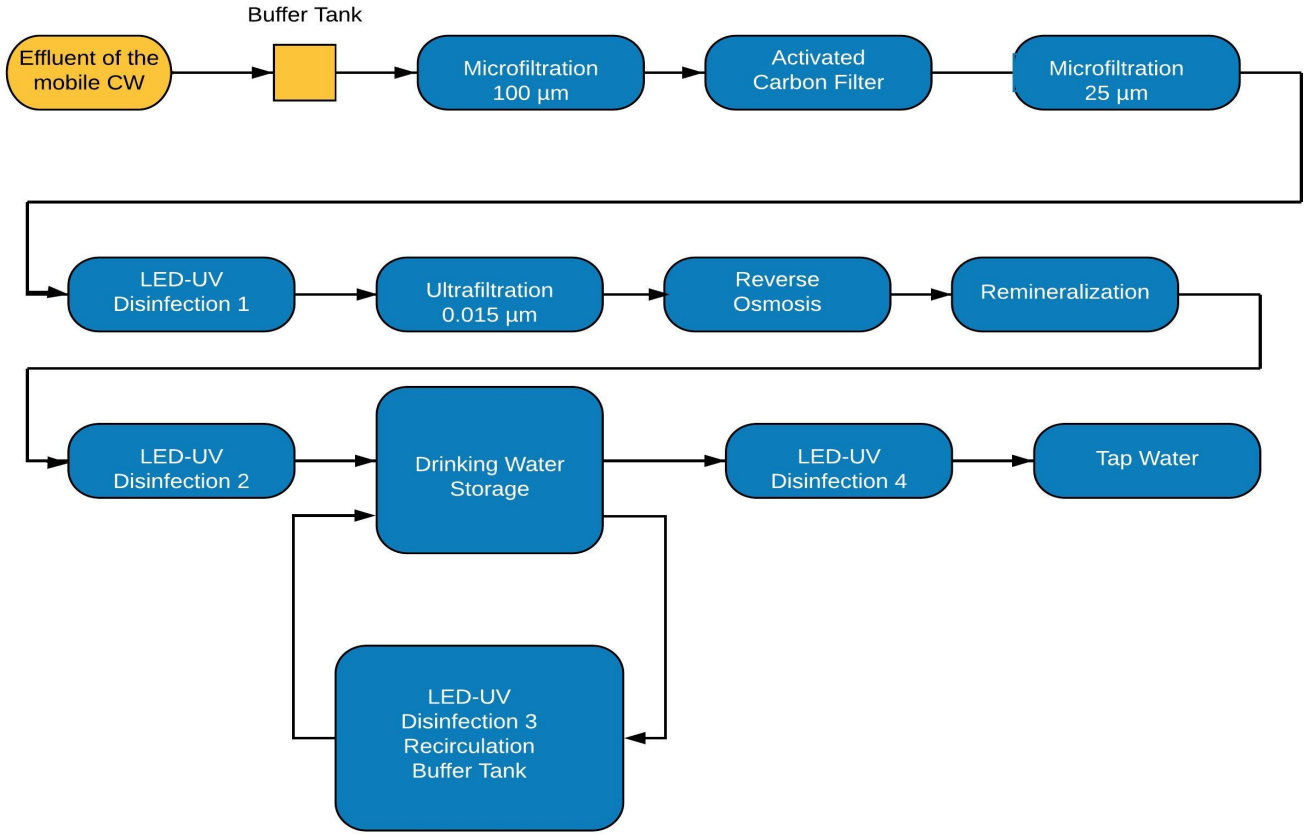
Source: Hussain et al., (2020)

1. **Design** of the Mobile Constructed Wetland

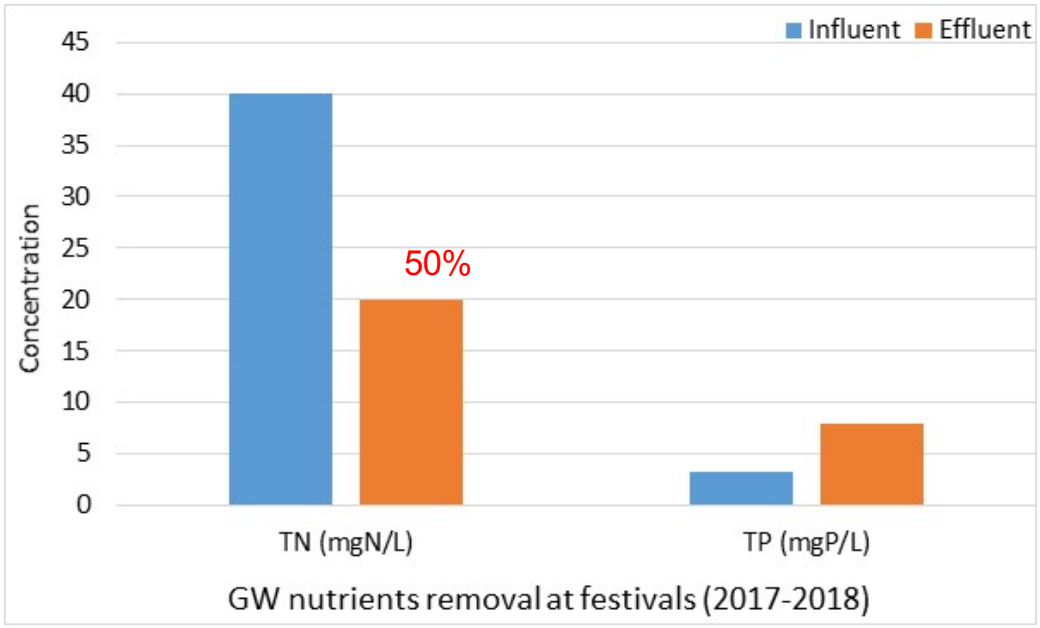
- Vertical flow constructed wetland
- Area = 15 m^2
- L x W x D = 6 x 2.5 x 1 m
- Volume = 15 m^3

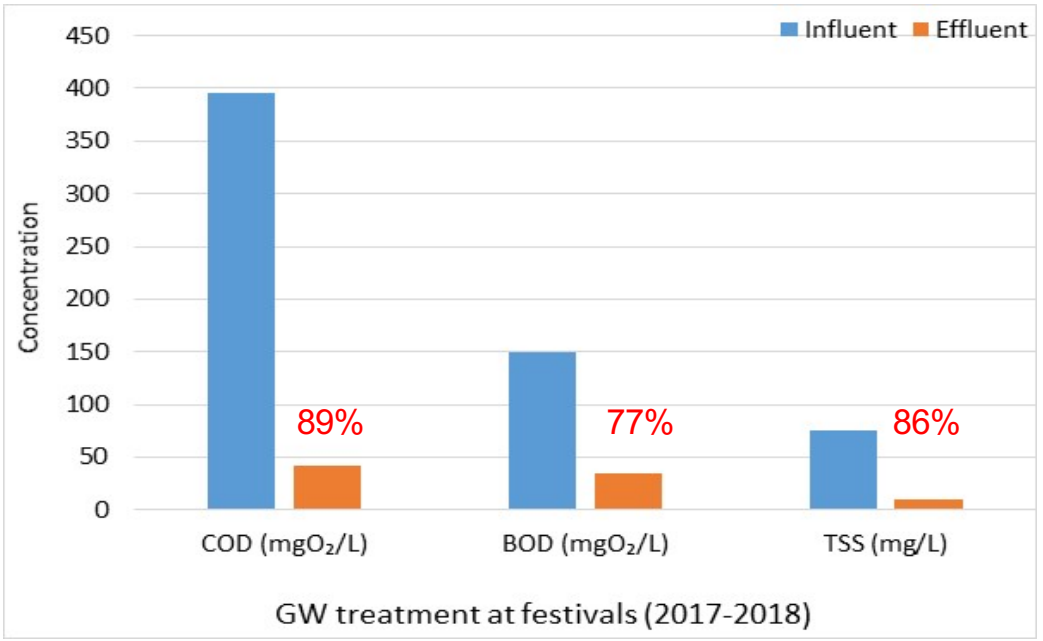


Drinking Water System



2. **Development phase:** tested with **GW** at festivals 2017-2018





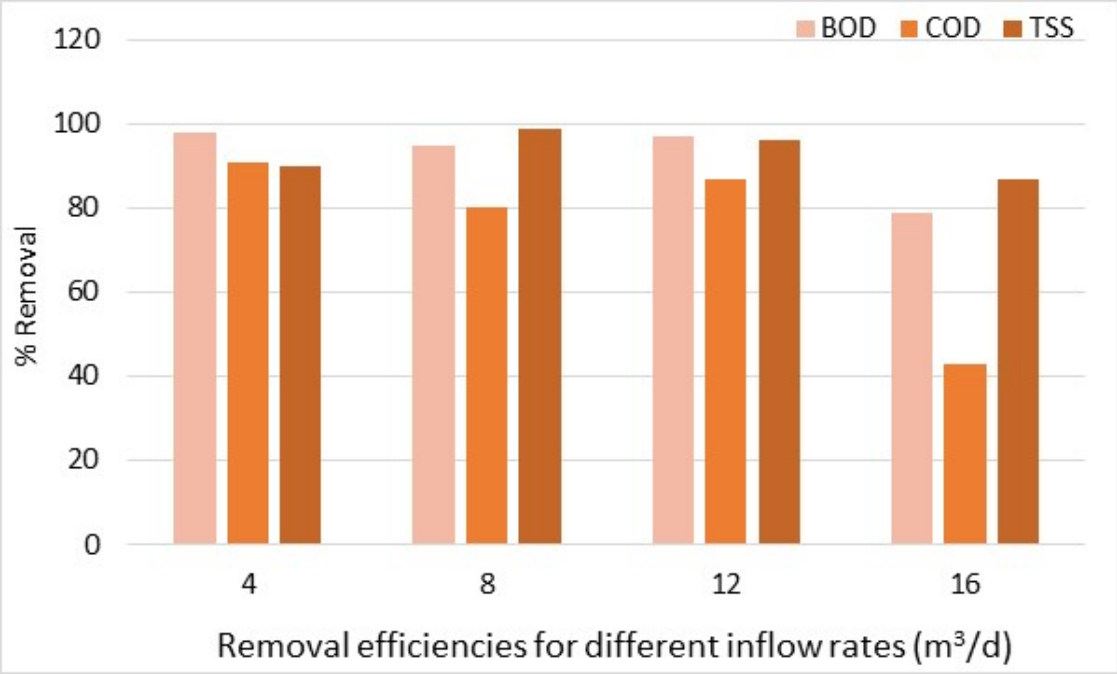
- Treated water = 26.6 $m^3.d^{-1}$
- HLR = 0.64 $m^3.m^{-2}.d^{-1}$
- Good removal of COD, BOD & TSS
- No P removal

➢ Despite very good removal, hydraulic operation needs to be optimized.

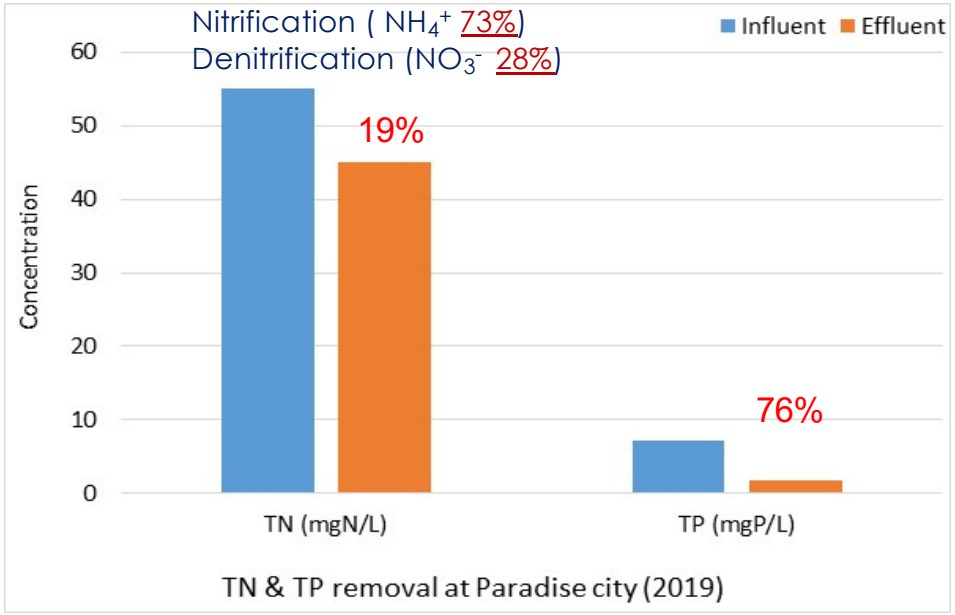
Limit:
BOD < 25 mg/L
TSS < 60 mg/L

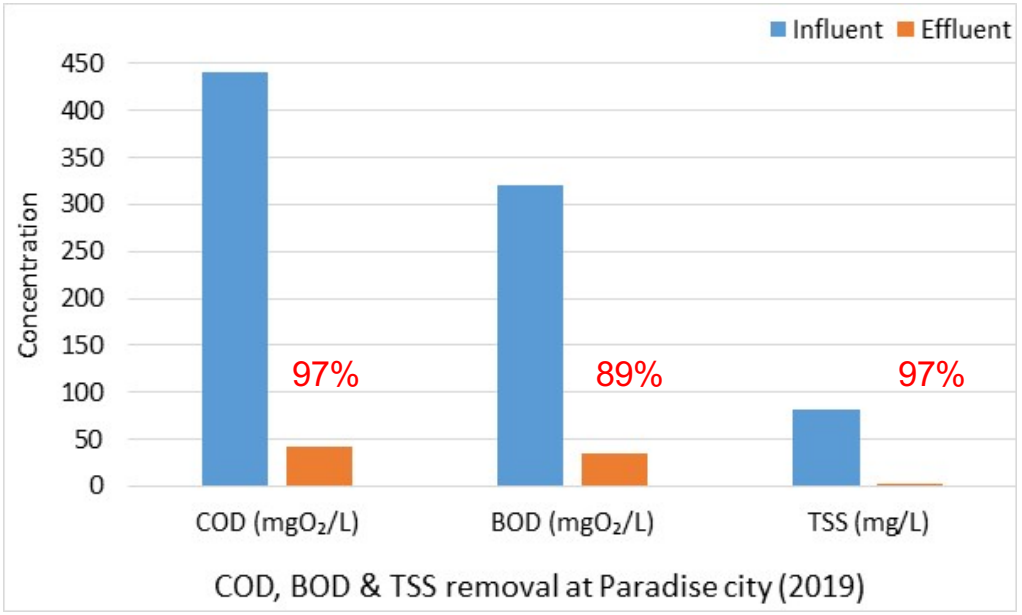
3. **Challenge test** to determine maximum hydraulic loading rate

- MCW suitable for GW
- Primary settled municipal wastewater
- Removal > 80%, except COD at 16 m^3/d.
- No nitrification/denitrification: Winter (±10 °C)
- No P removal



4. **Performance test** at Paradise city (2019)

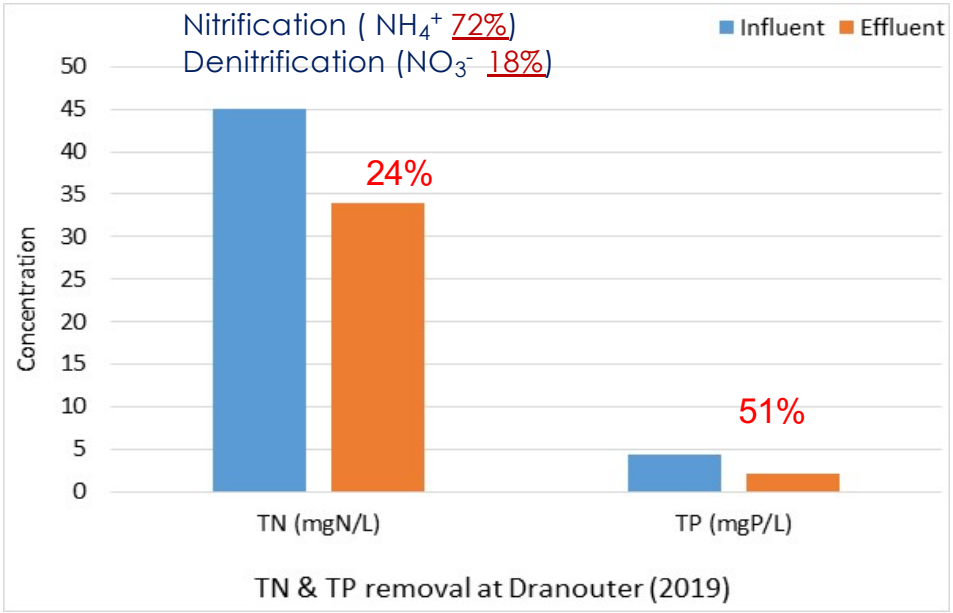


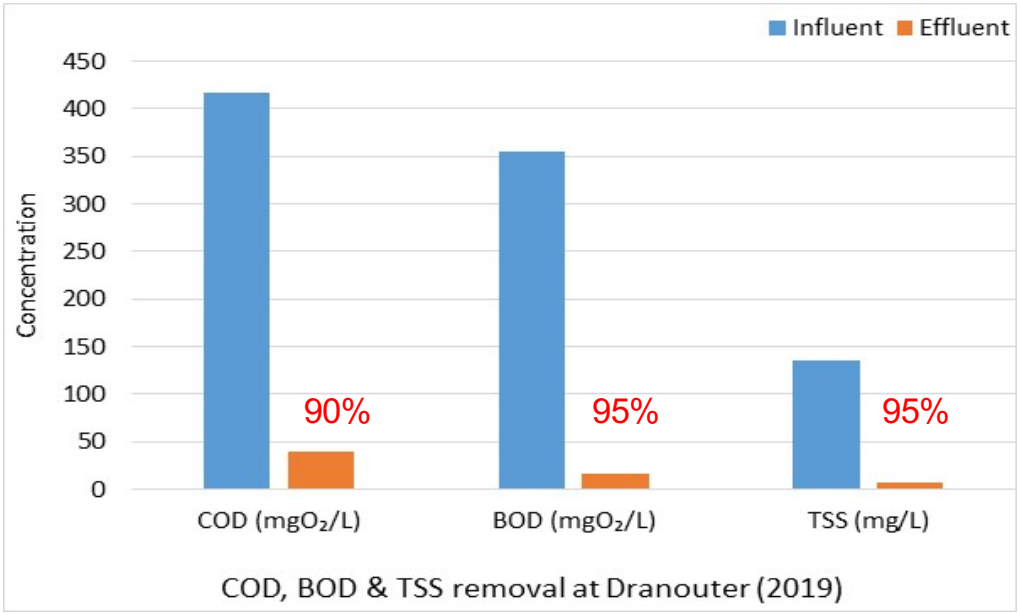


- Treated water = 11m^3
- HLR = 0.24 $m^3.m^{-2}.d^{-1}$
- COD & BOD removal >90%
- TSS removal > 95%, TP > 50%
- Less removal of N

Limit:
BOD < 25 mg/L
TSS < 60 mg/L

4. **Performance test** at Dranouter (2019)



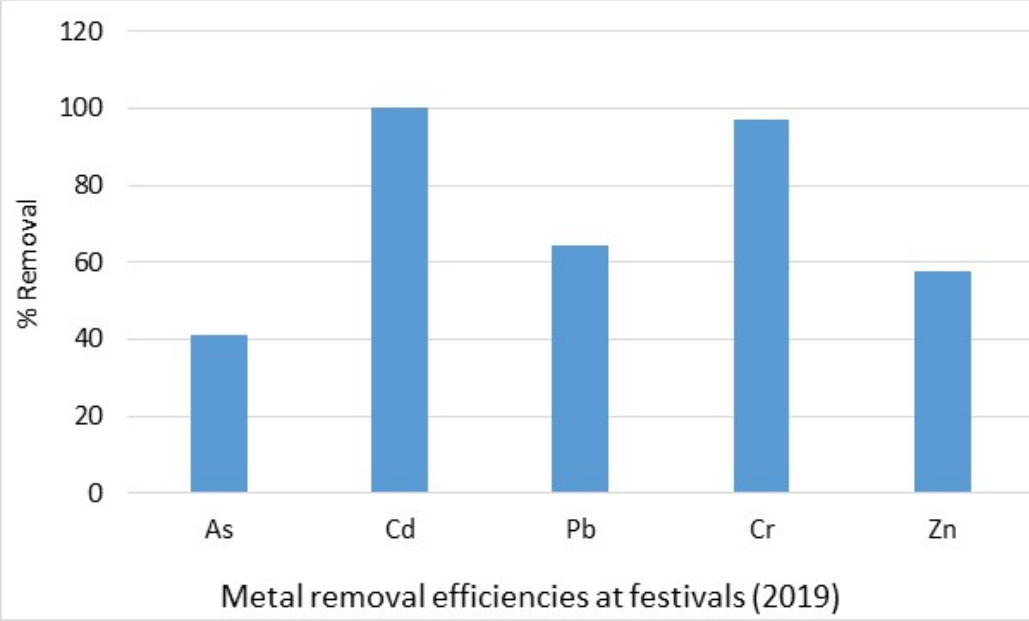


- Treated water = 92 m^3
- HLR = 2 $m^3.m^{-2}.d^{-1}$
- COD, BOD & TSS removal >90%
- TP removal > 50%
- Less removal of N

Limit:
BOD < 25 mg/L
TSS < 60 mg/L

4. **Performance test** at festivals 2019

- Efficient removal of metals
- All the micropollutants were under detection limit except diclofenac & trimethoprim which were removed through MCW.



4. **Performance test:** Drinking water system at Dranouter 2019

- Further removed nutrients and achieved drinking water standards

	Drinking water	Standard Limit
EC (µS/cm)	56.1 ± 42.1	2500
NH_4^+-N ($mgN.L^{-1}$)	0.28 ± 0.2	
NO_2^--N ($mgN.L^{-1}$)	0.31 ± 0.5	3
NO_3^--N ($mgN.L^{-1}$)	3.1 ± 4.1	50

CONCLUSION

1. **Development phase:**
   - GW and mixture of GW&BW can be treated.
   - GW-> to meet discharge limits.
2. **Challenge test:**
   - HLR of 1.1 $m^3.m^{-2}.d^{-1}$.
3. **Performance test:**
   - Contaminants including metals and micropollutants were removed.
4. **Drinking water system:**
   - Removed nitrogen components
   - Drinking water legislative standards met.

Reference

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THANK YOU.

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