El Port de la Selva
Indirect potable reuse at small scale using MAR

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Where is El Port de la Selva?
What is the idea?

- Infiltration of tertiary effluent of wastewater treatment plant
- Goals:
  - Augment water level in aquifer for drinking water production
  - Prevent seawater intrusion

Set-up:
- Tertiary effluent produced in WWTP and pumped the reclaimed water tank
- Water can flow from storage tank by gravity to the infiltration pond
- Infiltration basin upstream of well for drinking water production
Activities in 2014/2015

- Monitoring of groundwater quality + tertiary effluent
- Installation of additional piezometer
- First risk assessment (microbial + chemical)
- Modelling
  - Impact of rain on aquifer level
  - Travel time from pond to drinking water well (>600 d)
- Upgrade/improvement of WWTP performance
  - P removal
  - N removal
  - Validation of UV performance
- Construction of pipeline and ponds
- Start of infiltration November 2015
Planning data: average flow 200 m³/d → 3*150-180 m² ponds for intermitted operation
<table>
<thead>
<tr>
<th>Parameter</th>
<th>PoC</th>
<th>Countermeasure</th>
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</thead>
<tbody>
<tr>
<td>Total phosphorus</td>
<td>TE</td>
<td>Limit &lt; 2 mg/L Install Fe-Dosing</td>
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<tr>
<td>Ammonia</td>
<td>SE</td>
<td>Goal: &lt; 2 mg/L Increase aeration in WWTP</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>TE</td>
<td>Limit &lt; 10 mg/L Improved control (+ increased retention time in WWTP)</td>
</tr>
<tr>
<td>E.Coli</td>
<td>TE</td>
<td>Limit for E.Coli &lt; 1000 MPN/100 mL Filtration + UV</td>
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<tr>
<td>Salinity</td>
<td>SE</td>
<td>Goal: &lt; 1500 µS/cm EC online probe for shut down system in case of high EC</td>
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<tr>
<td>Turbidity</td>
<td>TE</td>
<td>As low as possible to avoid clogging of ponds Install frequency converters to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>improve operation of filtration (pending)</td>
</tr>
<tr>
<td>AOX</td>
<td>TE</td>
<td>Formation of chlorinated disinfection by products Chlorination to be switched</td>
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<tr>
<td></td>
<td></td>
<td>off</td>
</tr>
</tbody>
</table>

PoC: Point of compliance  SE: Secondary effluent  TE: Tertiary effluent
Risk assessment: pathogens (WHO approach)

- **Direct pathogen measurements** (Salmonella, Giardia)
- **Indicator to pathogen ratio** (Norovirus, Rotavirus, Campylobacter)
- **Epidemiological data**

### Exposure scenarios
(number of exposure event, ingested volume)

- **Pathogen concentration in influent**
- **Pathogen concentration in effluent**
- **Pathogen concentration after subsurface passage**
- **Pathogen concentration after chlorination**

- **Reduction in STP (sec. + Filtr. + UV), technical barrier**
- **Reduction during MAR (natural barrier)**

- **Dose-response model**
- **Probability of infection**
- **Probability of disease**
- **Risk of disease**

- **Severity factor for DALY calculation**
- **Disease per infection ratio**
RA results for RV: first tier estimation

WHO goal: < 1 μDALY

1 virus in 10,000,000L = operational zero
Tasks for 2016

- Monitoring of operation
- Virus sampling
- Installation of activated carbon filter for TrOC removal
- Complete risk assessment with field data
- Life cycle assessment to compare approach with other option
The European Union is acknowledged for co-funding DEMOWARE within the 7th Framework Programme under grant agreement n° 619040.
Modelled concentrations of pharmaceuticals in DW
(if no TrOC removal step is included)

Predicted pharmaceutical concentration dilution and biodegradation

Predicted concentration in ng/L

Acesulfame  Carbamazepine  Dihydroxy-Dihydrocarbamazepin  Sulfamethoxazole  Gabapentine