Closed loop sanitation in Syria

Pilot Implementation of Constructed Wetland in Haran Al-Awamied, Syria

(world water forum, Mexico 2006)
Present water and waste water situation in Syria

- In Syria 87% have improved sanitation (according to official info. 2004)
- Few wastewater treatment plants
- Diseases due to improper wastewater use in Syria

### Diseases due to improper wastewater use in Syria

<table>
<thead>
<tr>
<th>Disease</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis/A</td>
<td>4.050</td>
<td>2.843</td>
<td>2.929</td>
</tr>
<tr>
<td>Typhus</td>
<td>4.777</td>
<td>4.169</td>
<td>4.747</td>
</tr>
<tr>
<td>Acute infectious Diarrhea</td>
<td>147.765</td>
<td>158.003</td>
<td>199.556</td>
</tr>
</tbody>
</table>

Note: Only governmental hospitals statistics
Aims of the pilot project

- Improving the health situation in Syria
- Closing the loop by using the treated wastewater for irrigation
- Preserving the ground water by using the treated wastewater for irrigation
- Reducing water scarcity in the region
- Developing constructed wetlands as a more cost-efficient appropriate and reuse oriented wastewater treatment solution for semi-arid climate in Syria and Middle East
Project basic data and project description

- 7000 inhabitants (about 80% are connected)
- Combined public sewer system
- 250-300 m³/d domestic wastewater
- **Specific reed bed surface 0,5 m²/person** (compared to standard reed bed system in Europe of min. 2,5-7 m²/person)
- Pre-treatment: sand canal, fixed screens, sedimentation
- 2 vertical flow reed beds (68 m x 22 m x 1,5 m) for wastewater treatment
- 1 reed bed (20 m x 10 m x 1,8 m) for sludge drying
- 150 m³ collection tank for treated water for irrigation purposes
Operation Diagramm

1. Sediment Basin
2. Pumping station
3. Sludge drying bed
4. Reed Bed
5. Distribution pipes
6. Outlet control
7. Reed

Water quality control

Reuse for irrigation

[Images of water quality tests and sediments]
Results:

1. Economic aspects

- Low construction costs: 13,9 €/cap
  (compared to C.W. in Europe 400-1,500 €/cap and compared to conventional wastewater treatment in Syria ~ 200-250 €/cap)

- Low operation costs: ~1,0 €/cap.a
  (compared to C.W. in Europe 13-50 €/cap.a and compared to conventional wastewater treatment in Syria 50-100 €/cap.a)

- Production:
  1. Water: ~ 150 m³/d (for about 54 h. trees and 8 h. wheat) ~ 700 €/a
  2. Biomass: (1 reed 6 m length about 2,5 s.p) ~ 500 €/a
  3. Nitrate: (fertiliser for ~ 22,5 h. trees) ~ 450 €/a

- Job creation: 5 new jobs
2. Capacity building and research aspects

- Transferring a new appropriate Know-how
- Adapting the C. Ws. technology to local semi-arid hot climate conditions
- Teaching the people living around the C.W. especially the women to avoid using hard chemicals
- Explaining to local farmers to stop using fertiliser
- Increasing society’s interest in C.Ws. through a successful local action
- Developing and implementing an appropriate concept for low cost wastewater treatment systems
- Creating a new field for researchers
Conclusion

C.Ws. are an alternative treatment solution for wastewater:

- Low construction and operation costs
- Operation and maintenance sustainability
- Wastewater reuse directly at the location (closing the loop)
- Treated wastewater meets legal standards for irrigation
- Great interest and acceptance by public and governmental authorities
Thanks for your attention

Our earth is politically divided into many countries, but the topic Environment is beyond all state borders

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