‘Sanitation: An Overview’

- **Rural:**
  - Likely to be an on-site system (VIPs, UD-VIVs, PFs, ‘simple’ EcoSan)
  - but could be simplified sewerage in large villages

RESPONSIBILITY: generally the household, but support/advice commonly needed, also microfinance
Urine-diverting
alternating
twin-vault
VIV latrine

Ventilated improved
vault latrine

eThekwini
KwaZulu Natal
South Africa
Urine-separating toilet
Easy to convert into a “proper” EcoSan system (if that’s what the users want)
‘Sanitation at the household level (urban and rural)’

- Urban
  - but it’s really ‘periurban’

- Almost all population growth over the next ~50 years will occur in periurban areas in developing countries
WORLD POPULATION, 1850–2050

2000: ~1 billion
2020: ~1.5 billions

Year

- Rural population
- Urban population
- Urban slum population
Periurban:

- simplified/condominial sewerage
- unlikely to be EcoSan (costs …)
- only on-site systems if cheaper than simplified sewerage (depends on population density)
Simplified sewerage

Rigorous hydraulic design based on:

• a minimum sewer diameter of 100 mm
• a minimum tractive tension of 1 N/m²
• a minimum value for peak wastewater flow of 1.5 litre/second

➢ This results in a minimum gradient of 1 in 200, and a 100 mm dia. sewer being able to serve 234 households of 5 people with a water consumption of 100 litres/person day.
Comparative costs (1997 US$) of conventional and condominial sewerage in Parauapebas, Pará, north Brazil

<table>
<thead>
<tr>
<th>Item</th>
<th>Conventional sewerage</th>
<th>Condominial sewerage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total cost</td>
<td>Cost per connection</td>
</tr>
<tr>
<td>Excavation</td>
<td>263,000</td>
<td>39</td>
</tr>
<tr>
<td>Inspection chambers</td>
<td>181,000</td>
<td>27</td>
</tr>
<tr>
<td>Sewers</td>
<td>185,000</td>
<td>28</td>
</tr>
<tr>
<td>Total</td>
<td>629,000</td>
<td>94</td>
</tr>
</tbody>
</table>

**C O S T S**

- **South Africa:**

<table>
<thead>
<tr>
<th>Sanitation technology</th>
<th>Construction cost (ZAR, 2002*)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single-pit VIP latrine</td>
<td>600−3000</td>
</tr>
<tr>
<td>Single-pit PF toilet</td>
<td>2000−3000</td>
</tr>
<tr>
<td><strong>Simplified sewerage</strong></td>
<td>2500−3000</td>
</tr>
<tr>
<td><strong>EcoSan toilet</strong></td>
<td>3000−4000</td>
</tr>
</tbody>
</table>

Source: South African Dept of Water Affairs & Forestry

*Average exchange rates, 2002: ZAR 1000 = USD 87 = EUR 100.*

**With urine diversion.**
In this case, simplified sewerage cheaper than on-site sanitation at densities $>\sim 160$ persons/ha.
### EcoSan costs (USD) per household in urban areas of the nine UN regions of the world

<table>
<thead>
<tr>
<th>Region</th>
<th>Cost (USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sub-saharan Africa</td>
<td>$350</td>
</tr>
<tr>
<td>Southern Asia</td>
<td>$440</td>
</tr>
<tr>
<td>East Asia</td>
<td>$650</td>
</tr>
<tr>
<td>Eurasia</td>
<td>$725</td>
</tr>
<tr>
<td>Southeast Asia</td>
<td>$800</td>
</tr>
<tr>
<td>Oceania</td>
<td>$875</td>
</tr>
<tr>
<td>North Africa</td>
<td>$900</td>
</tr>
<tr>
<td>Latin America &amp; Caribbean</td>
<td>$1000</td>
</tr>
<tr>
<td>West Asia</td>
<td>$1200</td>
</tr>
</tbody>
</table>

*Source: Stockholm Environment Institute (2005).*
Sanitation planning

• Rural areas:
  Work with the beneficiary communities so that they will have a system they like and can afford, they understand how to (and will) operate and maintain properly, and they regard as their own.

Microfinance needed?
• **Periurban:** If simplified sewerage, then local water & sewerage agency should interact with the beneficiary communities to inform them what was going to happen, how they should operate the system (no garbage disposal), what to do when problems occurred, how much the monthly water bill would increase, and offer low-cost loans (to be repaid through the monthly water bill) to install household toilets – and, of course, no connection fees (too anti-poor)
Conclusions:

• **Rural:** mainly on-site sanitation, but possibly simplified sewerage in large villages.

• **Periurban:**
  
  (i) EcoSan infeasible for same reason as conventional sewerage – just much too expensive for poor households.

  (ii) Simplified sewerage probably always the sanitation system of first choice (low cost, socially & institutionally acceptable)