Time to think Out of the Box

Need of Wastewater Reuse in India

Anil Agarwal Dialogue: Excreta Does Matter
India Habitat Centre
March 4-5, 2013

Water Issues Facing – in India

- Increasing Urban Population and usage

- competition for water between water users –
domestic, industry, agriculture, others – Allocation issues

- Climate Change, Drought – scarcity of surface water.

- Depleting groundwater resources/salinity intrusion

- Unsustainable water use practices - NRW/UFW for Developing Nations

- Insufficient infrastructure for waste management – Developing Nations
The population of India, at 1.3 billion, is almost equal to the combined population of USA, Indonesia, Brazil, Pakistan, Bangladesh and Japan put together. The population of these six countries totals 1.3 billion.

The population of India has increased by more than 181 million during the decade 2001-2011. The absolute addition is slightly lower than the population of Brazil, the fifth most populous country in the world.

### POPULATION

<table>
<thead>
<tr>
<th>Total</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons</td>
<td>1,319,191,417</td>
<td>833,887,660</td>
</tr>
<tr>
<td>Males</td>
<td>623,724,248</td>
<td>427,917,052</td>
</tr>
<tr>
<td>Females</td>
<td>695,467,169</td>
<td>405,970,608</td>
</tr>
</tbody>
</table>

### DECIMAL POPULATION GROWTH 2001-2011

<table>
<thead>
<tr>
<th>Total</th>
<th>Rural</th>
<th>Urban</th>
</tr>
</thead>
<tbody>
<tr>
<td>Persons</td>
<td>181,455,986</td>
<td>90,469,913</td>
</tr>
<tr>
<td>Males</td>
<td>91,501,158</td>
<td>46,248,060</td>
</tr>
<tr>
<td>Females</td>
<td>89,954,828</td>
<td>44,221,853</td>
</tr>
</tbody>
</table>

### India - Water supply and demand gap

Gap between existing supply and projected demand in 2030 Percent of current demand

- **Water demand in agriculture**: Million cubic metre
  - 2005: 668
  - 2010: 797
  - 2020: 979
  - 2030: 1,195

- **Food grain demand**: Million ton
  - 2005: 656
  - 2010: 759
  - 2020: 875
  - 2030: 1,097

Source: McKinsey Report; Charting our Water Future - 2030
<table>
<thead>
<tr>
<th>Sector</th>
<th>Standing Sub-committee of MoWR BCM</th>
<th>NCIWRD BCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>2010</td>
<td>2025</td>
</tr>
<tr>
<td>Irrigation</td>
<td>688</td>
<td>910</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>56</td>
<td>73</td>
</tr>
<tr>
<td>Industry</td>
<td>12</td>
<td>23</td>
</tr>
<tr>
<td>Energy</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>Others</td>
<td>52</td>
<td>72</td>
</tr>
<tr>
<td>Total</td>
<td>813</td>
<td>1093</td>
</tr>
</tbody>
</table>

Source: Central Water Commission, MoWR. BCM – Billion Cubic Meter
Sewage Generation and Treatment Capacity in Metropolitan Cities, Class I and Class II towns in India

Source: CPCB Report Series: CUPS70/2009-10
STATUS OF WATER SUPPLY, WASTEWATER GENERATION AND TREATMENT IN CLASS-I CITIES & CLASS-II TOWNS OF INDIA

Three options for closing the supply-demand gap

Source: McKinsey Report; Charting our Water Future - 2030
Why Reuse of Wastewater is required

- To reduce the ever increasing gap of Potable Water Supply and Demand in Urban Cities
- To bring down billing charges of fresh water resulted due to long distance transportation, gradient and high energy costs.
- To mitigate conflicts of water resource allocation between the Domestic and Agricultural / Industry
- To reduce groundwater extraction and Increase conservation of water resources
- Make water and sanitation sector sustainable

Resource Sustainability

<table>
<thead>
<tr>
<th>Fresh Water</th>
<th>Recycled Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>– Source Availability and location</td>
<td>– Captive Resource</td>
</tr>
<tr>
<td>– Allocation (reservations for various Applications)</td>
<td>– No issues with Allocations</td>
</tr>
<tr>
<td>– Interstate Disputes</td>
<td>– No Interstate Disputes</td>
</tr>
<tr>
<td>– Increased O&amp;M – Theft, pipeline management</td>
<td>– Reduced O&amp;M, Short distances,</td>
</tr>
<tr>
<td>– Higher Cost to Industries</td>
<td>– Lower Cost to Industries</td>
</tr>
</tbody>
</table>
What are major concerns on Reuse Water

- Usage Type of recycled water?
- Availability of Treatment Technologies?
- Operability and Reliability?
- No Confidence in Gov. or private O&M operators?
- Consistently meeting water quality Standards?
- Health Issues? or
- Plain and simple – “Mind - Psychology”

Recycle and Reuse - Balancing Act
Locations of Potential Consumers

- Proposed STP 30mld
- Existing STP 20mld

MBR & RO Pilot Performance

- Flat Sheet Toray IonExchange MBR 50 kL/day
- MBR effluent Tank
- Reverse Osmosis 3 kL/day

<table>
<thead>
<tr>
<th>Water Parameter</th>
<th>Flat Sheet Toray MBR</th>
<th>MBR Effluent Tank</th>
<th>Reverse Osmosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD</td>
<td>180 to 225 mg/L</td>
<td>&lt; 2 mg/L</td>
<td>&lt; non detect</td>
</tr>
<tr>
<td>COD</td>
<td>360 to 500 mg/L</td>
<td>&lt; 8 to 20 mg/L</td>
<td>&lt; 10 mg/L</td>
</tr>
<tr>
<td>SS</td>
<td>450 mg/L</td>
<td>&lt; 2 mg/L</td>
<td>&lt; 1 mg/L</td>
</tr>
<tr>
<td>TDS</td>
<td>600 to 900 mg/L</td>
<td>600 to 900 mg/L</td>
<td>&lt; 20 mg/L</td>
</tr>
<tr>
<td>MPN</td>
<td>&gt; 1 million/100 mL</td>
<td>&lt; 10/100 mL</td>
<td>&lt; 2/100 mL</td>
</tr>
</tbody>
</table>
Bamroli Project – Components and Features

Project Components

- Bamroli STP
- Transmission
- TTP
- Transmission
- Water Storage Reservoir
- Distribution
- Ind. Users

Key Project Features

- Developer responsible for O&M for existing STP.
- Developer to design and build TTP and other Project Components. Developer will not receive any grant for construction of the TTP:Project Components.
  - Output norms for TTP defined but technical specifications were not defined.
- Developer responsible for transmission and last mile distribution of treated sewage.
- SMC guaranteed off-take of a minimum 40 MLD Industrial Grade Water from the TTP at the rate quoted by the Successful Bidder.
- Developer offered a 20 year Concession Period for Operating and Maintaining the above system.
What are the Drivers that turn people off towards any Reuse Project -

- The Disgust or “Yuck” factor;
- Perceptions of risk associated with using reuse water;
- Specific uses of recycled water;
- The sources of water to be recycled;
- The issue of choice;
- Trust and knowledge;
- Attitudes towards the environment;
- Environmental justice issues;
- The cost of recycled water; and
- Socio-demographic factors.
Promoters of Recycled Water

**Central Govt. or any State Govt.**
- Policy Development for R&R
  - Guidance Document with legal & Institutional drivers
  - Commercial/Fiscal incentives
  - Water Quality Regulation and monitoring
  - Arbitrations
  - Risk Management Framework

**SPV or any Water Board**
- Implementation of R&R
  - Demand Assessment and Marketing
  - Financial and Institutional framework
  - Public Awareness Campaign
  - Water Purchase and Sale agreements
  - Water Quality Monitoring
  - Customer Service

**Prospective Buyers**
- Commitment to use Recycled Water
  - Infrastructure for use of Recycle water
  - Water Quality and Quantity Bench-marks.
  - Point of use treatment, if required.
  - Promotion of Recycled water
Needs of Water Sector

- Development of Reliable and acceptable Reuse plans and suggestive methods.
- Development of reuse effluent guidelines based on end-use applications.
- Development of regulatory criteria and framework for Reuse: performance, redundancy, specifications, and safety & Health issues.
- Development of appropriate Public awareness campaign procedures to gain public confidence
- Guidelines for reuse projects under PPP and other funding scenarios

Way Forward

- Address Institutional and legal issues
- Preparation of Reuse Guidance Document that can be adopted by States.
- Promote Recycle and Reuse Educational & Public Awareness Programs – for non-potable and indirect potable applications.
- Develop Funding Alternatives for Reuse Projects
- Provide incentives to Industries and agencies using reclaimed water.
The Future Does Not Have to Be Dry
New Approach to Sustainability is to Convert Wastewater Treatment Plants into Water Factories

Potable Water

High Quality Reuse Water for All applications

Treatment for Recycle and Reuse

Sewage