US WATER INFRASTRUCTURE ECONOMICS

Lake Havasu on Colorado River
California Aqueduct
Central Arizona Project
Schuylkill River
Triangle Wastewater Treatment Plant

Arka Pandit
Messner Project
## Water Sectors and their Status:

<table>
<thead>
<tr>
<th>Water Sector</th>
<th>Grade (US)</th>
<th>Grade (GA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drinking (Potable) Water</td>
<td>D-</td>
<td>C+</td>
</tr>
<tr>
<td>Wastewater</td>
<td>D-</td>
<td>C</td>
</tr>
<tr>
<td>Industrial Wastewater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Municipal Wastewater</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stormwater</td>
<td>-</td>
<td>D+</td>
</tr>
</tbody>
</table>

- Georgia doing slightly better than US average, but still not in good shape.
Why invest in Water Infrastructure?

- Investment in water and wastewater systems pay substantial dividends to the environment, public health and the economy.
- Since the mid-1970s, investments made in drinking water systems prevented 2 – 4.7 million cases of gastrointestinal illness per year\(^1\).
- US portion of the Great Lakes generate about $7.0 billion and support 75K jobs in the fishing industry.
- Economic losses were estimated at $4.0 billion for the 1998 beach closure in New York and New Jersey.
Required Investment as in 2009:

5-year investment need (in Billions of dollars):
255.0

- $140.0, 55%
- $108.6, 43%
- $6.4, 2%

- Estimated actual spending
- American Recovery and Reinvestment Act
- 5-year shortfall
Category wise requirement for Wastewater sector:

- **Categories I and II:**
  - Wastewater Treatment Systems
    - Total: $69.1B, 34.1%

- **Category V:**
  - Combined Sewer Overflow Correction
    - Total: $54.8B, 27.1%

- **Category VI:**
  - Storm Water Management Programs
    - Total: $9.0B, 4.4%

- **Category X:**
  - Recycled Water Distribution
    - Total: $4.3B, 2.1%

**CWNS 2004 total documented needs (January 2004 dollars in billions)**

State wise distribution of investment requirement for Wastewater sector:

Distribution of total documented needs by State (January 2004 dollars in billions)

State wise distribution of investment requirement for Stormwater sector:

Distribution of total documented needs by State (January 2004 dollars in billions)

System wise requirement for Drinking water sector:

Total 20-Year Need (in billions of January 2003 dollars)

<table>
<thead>
<tr>
<th>System Size and Type</th>
<th>Need</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Community Water Systems (serving over 50,000 people)</td>
<td>$122.9</td>
</tr>
<tr>
<td>Medium Community Water Systems (serving 3,301 to 50,000 people)</td>
<td>$103.0</td>
</tr>
<tr>
<td>Small Community Water Systems (serving 3,300 and fewer people)</td>
<td>$34.2</td>
</tr>
<tr>
<td>Costs Associated with the Recently Promulgated Arsenic Rule</td>
<td>$0.9</td>
</tr>
<tr>
<td>Not-for-profit Noncommunity Water Systems</td>
<td>$3.4</td>
</tr>
<tr>
<td>American Indian and Alaska Native Village Water Systems</td>
<td>$2.4</td>
</tr>
<tr>
<td><strong>Subtotal National Need</strong></td>
<td><strong>$266.9</strong></td>
</tr>
<tr>
<td>Costs Associated with Proposed and Recently Promulgated Regulations (Taken from EPA Economic Analyses)</td>
<td>$9.9</td>
</tr>
<tr>
<td><strong>Total National Need</strong></td>
<td><strong>$276.8</strong></td>
</tr>
</tbody>
</table>

Distribution of investment required:

**Total 20 year need by projects:**

- Storage $24.8
- Treatment $53.2
- Source $12.8
- Other $2.3
- Transmission and Distribution $183.6

**20 year Regulatory and Non-Regulatory need:**

- 20-Year Regulatory Need $45.1
- 20-Year Non-Regulatory Need $231.7

Both graphs are in billions of January 2003 dollars

Some economic facts:

- There being no increase in investment, annual shortfall for different sectors in capital infrastructure:
  - Drinking Water: $11.00 Billions
  - Wastewater: $13.00 Billions

- However, this does not take into account any growth in the demand for the next 20 years.

- $390.00 billions need to be spent on replacing aging wastewater infrastructure systems and building new facilities in the next two decades.

- Federal assistance though the drinking-water state revolving loan fund (SRF) program was $9.80 billions in total, from 1997-2008, which is slightly more than the projected annual gap for those years.
Why is the need so large?

- Increasingly stringent federal requirements to improve water quality and drinking water safety.

- Increasing water supply costs as least-cost sources are depleted and the quality of raw water declines.
  - Increased requirement of material and energy to use more complex technologies in order to achieve the desired standard.

- Cost of replacing aging and failing water distribution systems and waste-water collection systems for the first time.
The impact of the investment can be categorized in four major categories:

- Economic Impact
- Environmental Impact
- Human Health Impact
Economic Impact
Economic Impact:

- Direct investment on the order of $10 billion in water/energy efficiency programs has the potential to boost U.S. GDP by $13 to $15 billion and employment by 150,000 to 220,000 jobs.

- The U.S. Conference of Mayors estimates that every job created in rebuilding our water systems creates nearly 3.7 jobs elsewhere, and every dollar invested in water infrastructure adds $6.35 to the national economy.
Job creation across different sectors:

<table>
<thead>
<tr>
<th>Economic Sector</th>
<th>GDP (Million $)</th>
<th>Employment (Jobs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ag, Forestry, Fish &amp; Hunting</td>
<td>$89</td>
<td>1,706</td>
</tr>
<tr>
<td>Mining</td>
<td>$181</td>
<td>591</td>
</tr>
<tr>
<td>Utilities</td>
<td>$232</td>
<td>438</td>
</tr>
<tr>
<td>Construction</td>
<td>$1,112</td>
<td>16,917</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>$2,313</td>
<td>24,315</td>
</tr>
<tr>
<td>Wholesale Trade</td>
<td>$1,016</td>
<td>8,353</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>$1,398</td>
<td>24,768</td>
</tr>
<tr>
<td>Transportation &amp; Warehousing</td>
<td>$357</td>
<td>5,235</td>
</tr>
<tr>
<td>Information</td>
<td>$431</td>
<td>2,459</td>
</tr>
<tr>
<td>Finance &amp; Insurance</td>
<td>$753</td>
<td>5,594</td>
</tr>
<tr>
<td>Real Estate &amp; Rental</td>
<td>$1,054</td>
<td>5,500</td>
</tr>
<tr>
<td>Professional- Scientific &amp; Tech Svcs</td>
<td>$818</td>
<td>9,123</td>
</tr>
<tr>
<td>Management of Companies</td>
<td>$305</td>
<td>2,242</td>
</tr>
<tr>
<td>Administrative &amp; Waste Services</td>
<td>$682</td>
<td>18,191</td>
</tr>
<tr>
<td>Educational Svcs</td>
<td>$57</td>
<td>1,651</td>
</tr>
<tr>
<td>Health &amp; Social Services</td>
<td>$437</td>
<td>8,328</td>
</tr>
<tr>
<td>Arts- Entertainment &amp; Recreation</td>
<td>$78</td>
<td>2,059</td>
</tr>
<tr>
<td>Accommodation &amp; Food Services</td>
<td>$220</td>
<td>7,077</td>
</tr>
<tr>
<td>Other Services</td>
<td>$1,113</td>
<td>17,548</td>
</tr>
<tr>
<td>Government &amp; Non NAICS</td>
<td>$857</td>
<td>13,409</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$13,501</strong></td>
<td><strong>175,504</strong></td>
</tr>
</tbody>
</table>

Comparison of investment made and projects ready for start:

- The Stimulus Bill, contained $2.0 billion in new funds for the Drinking Water State Revolving Fund (SRF) program and $4.0 billion for the wastewater SRF program.

- AWWA had identified more than $10.0 billion in "shovel-ready" drinking water projects that the stimulus funds could benefit and they could start as early as within 120 days of receiving the fund.
Environmental & Human Health Impact
Environmental Impacts:

- The eradication of Combined Sewer systems would negate the chances of Combined Sewer overflow, a major cause of watershed impairment.

- Eutrophication being a major global issue, tertiary treatment of wastewater effluent is required to meet the standard\(^1\). Portions of the Gulf of Mexico between Texas and Florida is so hypoxic that it is detrimental to the fish population there.

- Ensuring a healthy ecosystem thus preserving biodiversity.
Human Health Impacts:

- Pharmaceutical and personal care products are increasingly being found in the water supplies, which requires advanced treatment techniques to ensure the water safety.

- While the population is on the increase, current infrastructure fails short to meet the present need. An adequate infrastructure is required to serve the population without risking human health.
Need for Federal Support
Limitation of Local Revenue:

Limitation of local revenue generation can be attributable to:

- Public misperception of need
- Political resistance to change in fee structure
  - 22% of US population pay over 4% their annual income for water and wastewater (considered to be the affordability limit)
- Equity and affordability issues
Benefits of a Federal Role:

- Size of the challenge
  - The sheer magnitude of the anticipated funding provides enough rationale for federal involvement.

- Validation of needs
  - Increases the public awareness

- Program Stability and Predictability

- Varied options of financing
Conclusions:

“If the nation fails to meet the investment needs of the next 20 years, it risks reversing public health, environmental, and economic gains of the past three decades.”

References:

- 2009 ASCE Georgia Infrastructure Report Card
- America’s Infrastructure report Card, ASCE, 2009
- AWWA Issue Agenda, Job creation
- ‘Clean & Safe Water for the 21st Century’ – A Water Infrastructure Network Report