Importance of Water Resources Development

• Meeting rural drinking water & urban water demands
• Famine – to food self sufficiency – to net exporter
• Backbone to India's "Green Revolution"
• Higher productive response from land/farm inputs
• Role in poverty alleviation, social and economic equity
• Sustaining employment rate of the country
• Effective drought & flood mitigation
• Meeting industrial water demand, tourism
• Sustaining reserved forests & other ecological needs
• Eco friendly hydro-power
World’s total fresh water renewable resource: 42,370 Km³.
........ India’s share: 1900 Km³ (4.5%)

Renewable water is not evenly distributed over the globe.
........ Fewer than 10 countries possess 60% share
Year 1804: World population reached 1 billion.
Just 200 years later: World population crossed 7 billion.

Global per capita annual availability of water:
Year 1804: 42,370 M$^3$
Year 2017: 5,575 M$^3$

Population-2017
Global: 7.6 Billion
India: 1.34 Billion
(17.6%)
Issue of Water Stress

Total renewable water resources, 2011 (m³ per capita per year)

Source: WWAP, prepared with data from FAO AQUASTAT (aggregate data for all countries except Andorra and Serbia, external data) (website accessed Oct 2013), and using UN-Water category thresholds.

- India’s per capita per year water resource: 1400 M³
Issue of Growing Water Demand

- Share of non-agriculture water in high income countries: 70%
- Share of non-agriculture water in low & middle income countries: 18%
Issue of Water Source

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Quantum</th>
</tr>
</thead>
<tbody>
<tr>
<td>BCM*</td>
<td>%</td>
</tr>
<tr>
<td>Precipitation received</td>
<td>4000</td>
</tr>
<tr>
<td>Water Resource Potential</td>
<td>1869</td>
</tr>
<tr>
<td>Utilizable Water Resource</td>
<td>1123</td>
</tr>
<tr>
<td>Ground Water</td>
<td>433</td>
</tr>
<tr>
<td>Surface Water</td>
<td>690</td>
</tr>
</tbody>
</table>

14 days to renew waters of all rivers

1400 years to renew all groundwater

Globally, the pumps are removing 3.5 times more groundwater than what is naturally replenished

Sustainability?
Surface & groundwater sources are not competing sources; they supplement each other.

Dams are means (of storage/diversion) for overcoming space & time related variability.
Supply-side and Demand-side Management

Legend:
- Problem domain
- Solution domain

Challenges of new potential creation
Challenges of equitable distribution
Challenges of sustainable development
Irrigation Potential Development

Total land resource: 328.73 Mha

<table>
<thead>
<tr>
<th>Land-use</th>
<th>Area</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mha*</td>
</tr>
<tr>
<td>Forest area</td>
<td>70</td>
</tr>
<tr>
<td>Non-agricultural uses</td>
<td>26.5</td>
</tr>
<tr>
<td>Barren &amp; uncultivable</td>
<td>17.3</td>
</tr>
<tr>
<td>Culturable waste</td>
<td>12.6</td>
</tr>
<tr>
<td>Permanent pastures</td>
<td>10.2</td>
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<tr>
<td>Miscellaneous tree crops</td>
<td>3.2</td>
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<tr>
<td>Fallow land</td>
<td>26.3</td>
</tr>
<tr>
<td>Agricultural land</td>
<td>181.95</td>
</tr>
<tr>
<td>Net Sown Area</td>
<td>139.99</td>
</tr>
</tbody>
</table>

Area under irrigation: 66.1 Mha (47%)

- Surface water development: 450 BCM (65%); Part getting lost to sedimentation.
- Stage of ground water development: 62%
- Need for conjunctive ground water use
Participatory Irrigation Management

- Promotion of PIM mainly guided by Command Area Development & Water Management Program
- CADWM Program launched in 1974-75; restructured in 2004

Objectives of CADWM Program

- Utilize irrigation potential created
- Improve water use efficiency
- Increase agriculture productivity & production
- Bring sustainability in irrigated agriculture in a participatory environment
Areas for Priority Attention

- Water to every farm field
- Per drop more crop
- Doubling farmers’ income
- Cost-effective treatment & recycling of wastewater
- Improved data collection and forecasts (for both supply & demand)
- Augmentation of storage reservoirs
- Sediment management
- Dam safety
- Sustainable Participatory Irrigation Management
- Conjunctive ground water use
- Canal automation for introducing measurement and control for improving demand-side management