Rejuvenating Pakistan’s Water Economy

Policies, Institutions and Infrastructure
Introduction

- As a Finance person my perspective on the subject relates to the possibilities of converting the water resources of Pakistan into a competitive advantage for the national economy to generate growth and employment, rural poverty alleviation and prosperity for the masses.

- The 2005 report ‘Pakistan Water Economy Running Dry’ by John Briscoe and Usman Qamar of the world bank was a revelation, an inspiration and for me a great learning experience.
Introduction

- In a very comprehensive manner it laid bare the issues facing the water economy and possible way forward to harness the benefits of Pakistan's water resources. It also showed how investment in water projects had great impact on the rural poverty and had multiplier impact on both rural and urban economies in South Asia.

- Subsequently, The cabinet approved a comprehensive development and reform program for the water sector in 2006-07, but it remains unimplemented.
The Indus irrigation system

- Pakistan is one of the world’s most arid countries, with an average rainfall of under 240 mm a year.

- The population and the economy are heavily dependent on an annual influx into the Indus river system (including the Indus, Jhelum, Chenab, Ravi, Beas, and Sutlej rivers) of about 180 billion cubic meters of water,

- The Indus Valley Civilization (Harappa and Mohenjodaro)—flourished along the banks of the Indus.

- The Indus irrigation system became the largest contiguous irrigation system in the world. The desert literally bloomed, with irrigated agriculture providing the platform for the development of the modern economy of Pakistan.

Pakistan Economy Running Dry, World Bank 2005
INDUS BASIN RRRIGATION SYSTEM chronology

• The first two decades, 1950-1970, were spent by the retooling the entire system by connecting the western river to the eastern rivers to meet Pakistan’s requirements under the IWA.

• The next two decades (1970-90) were used primarily to stem the menace of water logging and salinity.

• The decade 1990-2000 was the “decade of stalemate”—political discord that was instrumental in stopping major investments by the public sector in the IBIS.

• The decade (2000-2010) saw activity when Pakistan was able to build and modernize the IBIS, barrages, maintenance, Mangla raising, Ghazi Bhrotha and Neelum Jhelum.

• 2010 -2017 Dasu, Tarbela extension started, IPP’s mode
The Indus Waters Treaty (1960)

Water Budget of the Indus Basin Irrigation System

- Mean Annual River Flows: 140-150 MAF
- Mean Annual Canal Diversions: 103 MAF
- Canal Supplies at Watercourse Head: 77 MAF
- Canal Supplies at Farm Gate: 54 MAF
- Groundwater Contribution: 50 MAF
- Irrigation Water at Farm Gate: 104 MAF

- Agriculture GDP: $50 billion -- $ 500 m per maf

Water Resources Research Institute, National Agricultural Research Centre, Islamabad.
<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>AREA (MH)</th>
<th>(MA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Geographical Area (total area)</td>
<td>79.3</td>
<td>196.0</td>
</tr>
<tr>
<td>2. Area suitable for agriculture</td>
<td>31.2</td>
<td>77.1</td>
</tr>
<tr>
<td>3. Irrigated + Barani</td>
<td>22.1</td>
<td>54.5</td>
</tr>
<tr>
<td>4. Irrigated area by all sources</td>
<td>18.0</td>
<td>44.5</td>
</tr>
<tr>
<td>5. Additional area that can be brought under irrigated agriculture</td>
<td>9.2</td>
<td>22.6</td>
</tr>
</tbody>
</table>
Almost all developed countries have followed a broadly similar path of early and extensive investment in water resources institutions and infrastructure to achieve water security and underpin growth.
There will of course be other reasons why societies are poor or rich, but we postulate that the significance of water investment is considerable – and little recognized.

This recognition sadly missing in Pakistan.
Water as a source of destruction and poverty – or production and growth choice for Pakistan

- Key Input in agriculture, Industry, energy, transport, healthy ecosystems
- Force for destruction well known in Pakistan
  - Flood, drought, landslides, disease
  - Erosion, inundation, desertification, contamination and disease.
- Achieving basic water security, harnessing the productive potential of water and limiting its destructive impacts, has to be focus of Pakistan’s water strategy
- Water resources development and management remain at the heart of the struggle for growth, sustainable development and poverty reduction.
- All industrial countries, have invested early and heavily in water infrastructure, institutions and management capacity.
- ‘Institutions’ includes capacity, organizations, policies, rules, and agreements.
Pakistan Economy Running Dry

- **Sobering Fact #1:** *Water Stress.* Pakistan is already one of the most water-stressed countries in the world, a situation which is going to degrade into outright water scarcity due to high population growth.

- **Sobering Fact #2:** *There is no additional water to be injected into the system.*

- **Sobering Fact #3:** *A high risk water environment.* Pakistan’s dependence on a single river system

- **Sobering Fact #4:** *Large-scale degradation of the resource base.* There is abundant evidence of wide scale degradation of the natural resource base on which the people of Pakistan depend.
Sobering Fact #5: *Groundwater is now being overexploited in many areas, and its quality is deteriorating.*

Sobering Fact #6: *Flooding and drainage problems are going to get worse, especially in the lower Indus Basin.*

Sobering Fact #7: *Climate change.* The Indus Basin depends heavily on the glaciers of the western Himalayas which act as a reservoir, capturing snow and rain, holding the water
Pakistan Economy Running Dry

- Sobering Fact #8: *An inadequate knowledge base.* The Indus Basin is a single, massive, highly complex interconnected ecosystem the once-renowned Pakistan water planning capability has fallen into disrepair.
- Sobering Fact #9: *Much of the water infrastructure is in poor repair.*
- Sobering Fact #10: *The quality of project implementation is poor.*
- Sobering Fact #11: *The system is not financially sustainable.* There are three basic questions relevant to the financing of infrastructure—who pays? How much is paid? and how is the money used?
Pakistan Economy Running Dry

• **Sobering Fact #12:** *Pakistan has to invest, and invest soon, in costly and contentious new large dams*

• Relative to other arid countries, Pakistan has very little water storage capacity. Whereas the United States and Australia have over 5000 cubic meters of storage capacity per inhabitant, and China has 2200 cubic meters, Pakistan has only 150 cubic meters of storage capacity per capita.

• The dams of the Colorado and Murray-Darling rivers can hold 900 days of river runoff. South Africa can store 500 days in its Orange river, and India between 120 and 220 days in its major peninsular rivers.
• **Pakistan can barely store 30 days of water in the Indus Basin**

• **Sobering Fact #13:** *Poor governance and low trust.*

• Conceptually the simplest task for water managers in the Indus Basin is to move water in a predictable, timely manner to those who need it and have a right to it.

• Pakistan has among the best water engineers in the world. And yet this task is done less and less satisfactorily, less in the light of day and more behind an opaque curtain in which, as always, monopoly + discretion − accountability = corruption.
The result is inequitable distribution of water, poor technical performance, and a pervasive environment of mistrust and conflict from the provincial level to the water course. The water bureaucracy has yet to make the vital mental transition from builder to manager.

Sobering Fact #14: Water productivity is low. Large parts of Pakistan have good soils, abundant sunshine, and excellent farmers. And yet crop yields, both per hectare and per cubic meter of water, are much lower than international benchmarks, and much lower even than in neighboring areas of India. Yields from reliable, self provided groundwater are twice those of unreliable and inflexible canal supplies.
Pakistan Agriculture

- Only 35% of River flow reaches the farms
- 1 maf at farm gate generates approximate $500m output
- Irrigated agriculture uses 2.33 feet per acre every year
- Agriculture GDP : Total GDP; 1:5

In Comparison California
- 1 maf water generates $2 billion of output
- Irrigated Agriculture needs 1.5 feet per acre
- Agriculture GDP : Total GDP 1:50
Murray-Darling River system

- Water efficiency is 90%, 10% used for port/sea
- 4-5 provinces of Australia share the water resource
- Water sharing and use protected by constitutional arrangements
- Up to 100 acres allocated 2 feet per acre
- Above 100 acres allocation 1.5 feet per acre
- 1 maf water yields on the average $2 billion output
- Extensive support systems for farmers for crop management and water efficiency
- Mostly horticulture and livestock
Potential output of new farm land

- At current water efficiency bringing 20 million acres under irrigation would need 47 maf of additional water.
- At current agriculture productivity would add $23 billion in direct agriculture GDP.
- High value added agriculture with high water efficiency would need 30 maf water and could add up to $30 billion in agriculture output.
Increasing water productivity on existing farms

- 45 million acres of farm land
- Improving water efficiency to 2 feet/acre would save 14 maf of water for new farms
- Improving water productivity from $500m/maf to $1b/maf through high value agriculture and predictable water availability
- Boost Agriculture GDP by $40b per year
Improving water efficiency

- Water losses in canal system approximately 50maf
- Additional water storage from 30 days to 100 days
**Power benefits**

- Hydel power capacity potential 80000 MW
- Current capacity 6500 MW
- 1000 mw capacity on our rivers generate annual average 4.6 billion units of power
- 10000 mw will generate 46 billion units of power annually at Rs 2 per unit (as a by product of a multipurpose dam).
- The annual cost of producing equivalent power from coal, Diesel/furnace oil will be Rs 500 billion at current prices
Dams and Hydel projects in Pakistan

- Diamer-Bhasha Dam
- Gomal Zam Dam Project
- Akhori
- Kalabagh Dam
- Dasu
- Mangla Dam raising
- Mirani Dam
- Munda
- Bunji
- Skardu
- Tarbela Dam extension
- Neelum Jhelum
- Indus Cascade
Pakistan Water Economy Running Dry.
Night Time Image
Rural Sindh Socio-economic situation

- Sindh has the highest incidence of absolute landlessness, highest share of tenancy and lowest share of land ownership in the country. WB

- Wealthy landlords with holdings in excess of 100 acres form less than one per cent of all farmers in province, and own 150 per cent more land than combined holdings of 62 per cent of small farmers with holdings less than five acres.

- Rural poverty in Sindh is higher than the country average
Water politics of Sindh

- Rural Sindh is rapidly falling behind, the urban rural economic divide is growing and rural poverty is rapidly expanding
- Lack of water resources is spreading rural poverty
- Landless hari’s lack means of survival
- Youth unemployment is increasing and despondency is increasing with no hope in sight
- Rural GDP is stagnating and industrial development is lagging
- Investment is shrinking
- Millions of acres state land could have been developed and allocated to the haris but ruling classes want to appropriate water resources and state land
- Major conflict of interest
Pakistan Economy Running Dry

• A curiosity is that the most vehement opposition to new dams comes from Sindh, when in fact it is the downstream riparian who is typically the greatest beneficiary of the enhanced regulation which comes with new storage.

• (For this reason, in other countries lower riparians will often pay for upstream storage.)

• The requirements for government are obvious—there needs to be a totally transparent and verifiable implementation of the 1991 Water Accord, and reasonable quantities of water need to be guaranteed and delivered to the delta
STATUS:

- Phase-I of Rainee Canal from RD 0+000 to 363+000 has been completed along with its distribution system as shown on the Map in purple colour.

- Phase-II of Rainee Canal from RD 363+000 to 556+000 is yet to be started as and when concurrence from GoS is received.

- The Proposed Thar Canal as shown in the Map with dotted blue line which will off take from Rainee canal RD 181+000 will be constructed after completion of Feasibility Study. The concurrence of GoS is still awaited to commence the Feasibility Study of Thar Canal by WAPDA.

- GoS has been approached for taking over of completed Phase-I of Rainee Canal Project for O&M which is still in process.
## RAINEE CANAL PROJECT - SALIENTS

### SALIENT FEATURES

<table>
<thead>
<tr>
<th>Feature</th>
<th>Phase–I</th>
<th>Phase–II</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Off take Location</strong></td>
<td>Guddu Barrage (Left Side)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Canal Capacity</strong></td>
<td>Presently 5,155 Cusec for Rainee Canal and in future it will be enhanced up to 10,000 Cusec when Thar Canal will be constructed at RD 181+000 after completion of Rainee Canal.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Command Area (Acres)</strong></td>
<td>Phase–I 113,690 (Ghotki District)</td>
<td>Phase–II 298,710 (Ghotki, Sukkur &amp; Khairpur Districts)</td>
<td>Total 412,400</td>
</tr>
<tr>
<td><strong>Main Canal Length (Km)</strong></td>
<td>110</td>
<td>65</td>
<td>175</td>
</tr>
<tr>
<td><strong>Distribution System (Km)</strong></td>
<td>128</td>
<td>481</td>
<td>609</td>
</tr>
<tr>
<td><strong>Approved PC–I (Rs: Billion)</strong></td>
<td>20.473</td>
<td>23.513</td>
<td>43.986</td>
</tr>
<tr>
<td><strong>Revised PC–I (Rs: Billion)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Start and Completion Dates Phase–I</strong></td>
<td>Start: October 02, 2002</td>
<td>Completion: June 30, 2014</td>
<td></td>
</tr>
<tr>
<td><strong>Physical Progress</strong></td>
<td>Phase–I 100% Completed Phase–II Yet to be Started</td>
<td></td>
<td></td>
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<tr>
<td><strong>Financial Progress</strong></td>
<td>91.34 %</td>
<td></td>
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</tr>
<tr>
<td><strong>PSDP Allocations FY 2015-16</strong></td>
<td>Rs: 1000 Million</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Expenditures upto 30.06.2015</strong></td>
<td>Rs: 17681 Million</td>
<td></td>
<td></td>
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<tr>
<td><strong>Pending Liabilities</strong></td>
<td>Rs: 1210.906 Million</td>
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Rainee Canal Project Escape Channel

Head Regulator
Rainee Canal Project Head Regulator
Rainee Canal Project Canal Section D/S of Cross Regulator
Environmental Impact

Rainee Canal Project Escape Channel
Financing arrangements

- Historically Water infrastructure has been financed through Government Budgets
- An exception was made in the construction of the neelum jhelum hydro power project
- It was organized as a company
- A surcharge of 10 paisa per unit on electricity bills of WAPDA users was imposed and the proceeds deposited in the company’s account
- Approximately $100 m annually is being generated. This will generate $800m over construction period of the project
- The remaining funding of around $1200 million was raised through suppliers credit. No donor funds were obtained at financial close.
Financing Arrangements

- For the future Users contribution is a must for reducing debt exposure
- WAPDAs network has billing of 100 billion units every year
- Paisa 50 per unit power development surcharge would generate $500m every year
- Irrigation network provides roughly 60 maf of water to the farms Rs 500 per acre foot per year would raise $300 m per year
Financing Arrangements

• If users can contribute say $600m a year it can support debt financing of another $1400m (30% equity 70% Debt)
• Thus $2.0 b per year can be spend on Dam construction per year enough to build a dam like KBD every 4 years
• Each dam would be organized as a corporate entity with dedicated revenue flows to service the debt.
• Ultimately Shares of the completed Dams could be sold to the people of Pakistan or privatized to start construction of new dams
Way Forward

• Recognize that water resources are a potential competitive advantage for Pakistan’s economy

• Need a very clear national vision for water resources management and development for fostering national prosperity and poverty alleviation.

• Target a billion dollar of output per maf of agriculture use, 10000 mw of power and 20 maf of additional water storage capability in the next ten years

• Need a concerted effort to develop consensus on depoliticizing Decision making on dams and build up support for equitable distribution of costs and benefits of the water economy
Way Forward

- Need a comprehensive strategy for managing and development of water strategy comprising
  - Strategy for maximizing water efficiency in agriculture
  - Extending irrigation network to 20 million acres of new farm land
  - Strategy for building water storages for inter and intra year variability of water availability. Target 3 months of storages
  - Strategy for switching over to high value added agriculture
  - Strategy for allocating water for Urban economy
Institutional Arrangements

- Council of common interests
- Ministry of Water
- Water and power development authority
- Private sector service providers
- IRSA
- Provincial irrigation department
Institutional Reforms

- Rename and Transform Ministry of Water and Power into Ministry of Water Resources Management and Development
- Capacity building of WAPDA to undertake a second Indus basin development program
- Build IRSA capacity for transparency and confidence building amongst Provinces
- Create capacity for producing hydraulic skills in universities of Pakistan
- Create public private partnership entities