WATER MARKET IN PAKISTAN A CASE FOR REVENUE GENERATION AND WATER SECURITY

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ABSTRACT

"Pakistan is a water scarce country which could run out of water in 2025 or 2040," is one of the popular news widely under debate nowadays. Unchecked population growth, deteriorating water quality and climate change are said to be the major drivers of increasing water shortages. Water experts have been warning that water crises could strike anytime. In recent months, media raised water issues at such a scale that suddenly it emerged as a priority matter of public interest. These serious concerns have triggered a national debate loaded with many questions. Is Pakistan a water scarce country running out of water? If water is scarce then why it is allocated for wasteful and low value agriculture sector almost free (60,000 litres per 1 US cent)? Is water a public good or a private commodity? Should water be priced to encourage market based allocation towards high value end use or should it be supplied free because it is a basic human right? Is the government benevolent enough to continue provision of adequate, predictable, reliable and affordable water service to all sectors? Should the government act as a regulator or a service provider? Who will be the winners and losers if water is properly priced as a market commodity? How could water pricing contribute to economic growth and water security? This paper attempted to answer some of these questions in order to inform policy makers, water managers and general public to cope with water crises in Pakistan.

The paper suggests that water shortages are real, caused mainly by paucity of governance and economic disincentives. The good news is that there is an enormous potential for water reallocation to achieve long term security, higher productivity, equity and revenue generation. The paper recommends policy measures to promote private sector driven value added water economy.

Keywords: Water Scarcity, Allocation, Market, Pricing, Security, Irrigation, Value added water economy

1. INTRODUCTION

Pakistan is a predominantly a semiarid country with an average annual rainfall of 250 mm. The country is blessed with the mighty Indus River, the cornerstone of Indus civilization and the darling of thirsty conquerors for thousands of years. The Indus River and its tributaries, also called *Abaseen* (the father of rivers), supply an annual average flow of 170 Billion Cubic Meters (BCM) originating from the Himalaya-Karakorum-Hindukush region. 60% of the river flows are snow and ice melt water which makes the question of climate change quite relevant for Pakistan. The country has a vast alluvial plain underlain by unconfined sweet water aquifer which contributes an annual discharge of 74 BCM for economic and domestic purposes. Geographically, Pakistan is blessed with sufficient water resources – ranking 36th in the world in terms of river water availability. Regarding national water security, over 70% of water originates from across the border (India, Afghanistan and China) which makes the country highly dependent on trans-boundary water flows.

Pakistan is a water scarce country as its annual per capita water availability has recently dropped below 1000 cubic meters (m^3). The main reason is indeed the size of population which reaches to 207 million in 2017. Despite of frequent floods, the storage capacity is

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mere 9% of the annual river flows. Due to the plain topography, the spreading (through flood irrigation) of water over vast lands, through a massive irrigation infrastructure, was a good strategy for crop production as well as groundwater recharge, which is subsequently used through more than one million pumps. However, this massive diversion (over 70% of the annual flows) comes at a huge cost to the environment and economy, especially for the lower riparian, delta mangroves, wetlands and sea water intrusion. Since 2010, the country has been facing floods every year, damaging human settlements, infrastructure and agriculture crops, besides irreparable human loss. An estimated $20 billion loss is inflicted by floods since 2010.

In the face of such natural abundance, the country has been facing severe water shortages in all sectors; the worse is witnessed in cities like Karachi, Quetta and Lahore. Daily media reports showcase people with water buckets waiting in long queues (water inflation) in all major cities. Farmers from the tail-end of canal system could be seen everywhere protesting on water shortages. The main victim of this water shortage is poor, slum dwellers, smallholder farmers, disadvantaged and marginalized communities all over the country. According to the National Drinking Water Policy (GOP, 2009) water borne diseases inflict a loss of $1 billion to the national economy each year. Reports suggest that an estimated 250,000 children under five die every year in the country due to diarrheal diseases. Pakistan council of Research in Water Resources reported 80% of the drinking water in Pakistan is not safe. The country is grappling with excess water (floods) on one hand, and shortages (quantitative and qualitative) on the other. The issue here seems to be purely governance of water rather than its natural stocks.

Looking at the water allocation aspect reveals that it is all about agriculture sector which takes away 95% of withdrawal but contribute only 20% to the GDP. Government charge a farmer $2.4 per hectare per year, irrespective of the crop grown and quantity of water used (or 60 cubic meter per one US cent). The same farmer pays more than $80 per hectare when using groundwater through private pumping. This situation makes it clear that two types of water market exists simultaneously; public sector which provides fresh water (to rich and poor alike) almost free and private sector which earns millions by selling the same water at a market price. The misery of one proves blessing for others. Tanker mafia with illegal hydrants in all major cities have been earning millions of dollars by providing water of unsafe quality to residents at a price ranging from $10 - 40 per tanker (5,000 - 10,000 cubic meters). Multi-national and domestic companies (Nestle) sell one litre of water at $0.50. There is no correlation between public and private sector water pricing. This is where the crux of the problem lies when public sector allocates expensive freshwater to agriculture sector for free, although farmers are willing to pay market-based price.

2. IS PAKISTAN RUNNING OUT OF WATER

Water scarcity means that the available water in a country is no more sufficient to meet the domestic, agricultural, industrial and environmental requirements. Physical availability is not uniform across space and time. For example, northern Pakistan has abundant water compared to Baluchistan, southern KP, southern Punjab and parts of Sindh. Similarly, 70% water comes during three months (summer monsoon). This physical water scarcity makes it a challenge for government to allocate adequate water to all regions, for all uses all the times. This spatial and temporal water availability is not distributed fairly and equally. The rich, being part of the decision making process, can access to whatever water is available in the system and can also circumvent shortages by opting for expensive water alternatives. The poor has nowhere to go but use inadequate, low quality water or buy expensive tanker water. This is called economic water scarcity.

Based upon the parameters of Falkenmark Indicator, Pakistan has recently entered into the list of water scarce countries when its annual river availability per capita falls below 1000 cubic meters. Although, population and economic growth are decisive factors in supply-

demand equation, public policy and technologies could play critical role as well. For example, scientists in the United States projected in 1970 that the annual water demand will reach to 1800 BCM in 2000. However, due to better policies and efficient technologies, the actual annual water demand in year 2000 remained below 600 BCM, despite the fact that both the economy and population grew substantially (Siddiqi, 2018). Similarly, analysing the average number used for scarcity determination at a country level does not provide the true picture of because of the geographic and temporal variations involved. Northern Pakistan receives abundance of rainfall (500 -1000 mm) while southern parts receive only 100 - 200 mm annually. Similarly, 70% water availability occurs during the three summer months (July -September), meaning the country is having abundance of water at one time of the year while facing scarcity at another time. Furthermore, the degree of economic growth and urban-rural disparity makes the scarcity index further fuzzy. In short, water supply and demand varies for different regions, seasons and economic conditions of the people and thus the scarcity indicator does not represent such variations at local scale. It could be argued that in most cases it is the water allocation policy rather than its natural availability which determines the degree of water scarcity. Netherlands and Israel both present unique cases where the former deals successfully with excess water (40% of the country is below sea level) while the later manages scarce water resources productively (less than 250 cubic meters per capita) through better policies and efficient technologies. A focused discussion on agriculture sector in Pakistan, which is the largest single water consumer, could be a classic example of how water allocation and pricing policies contributes to low productivity and an apparent water scarcity.

3. AGRICULTURE SECTOR WATER ALLOCATION

Pakistan is termed as a water scarce country but its water allocation policy does not support this statement. Agriculture takes away 95% fresh water and yet it contributes only 20% to the GDP. The four major crops of wheat, cotton, sugarcane and rice consume 80% of the agriculture water which contribute 5% to the GDP. The rigid supply-driven world's largest contiguous irrigation network provides an in-built incentive for wastage and low value cropping pattern. The irrigation infrastructure was primarily designed by the colonial British rulers to spread water thinly for production of food crops on the basis of 60% cropping intensity. Today, it is used for more than 120% cropping intensity and for production of variety of crops, including water intensive rice and sugarcane. The gap in canal water supply is bridged with excessive groundwater pumping. After more than 100 years, the water application method of flooding is still widely used. The agriculture sector is facing low productivity compared to regional countries, both in terms of yield and GDP per cubic meters (Figure1). Water rights are tied up with land and hence cannot be reallocated to other productive uses under the current policy environment.

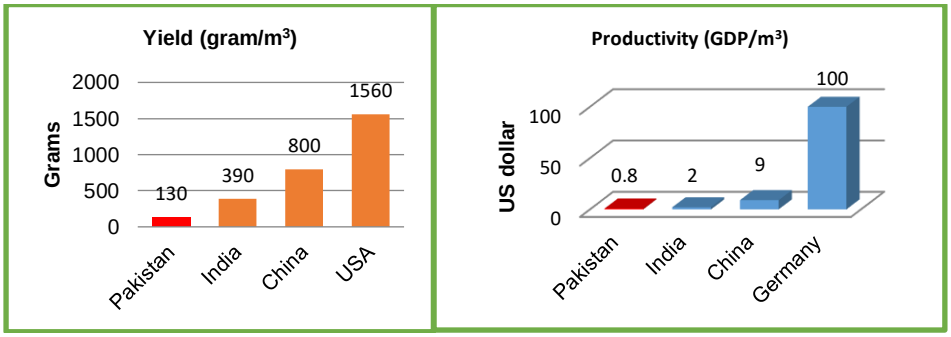

Figure 1. (Left) Grain Productivity per unit of water; (Right) Agriculture productivity in terms of GDP

Rice, grown on 2.5 million hectare and consuming about 25 BCM water annually, gives an average yield of 2.95 t/ha compared to 7.4 t/ha in USA and 6.19 t/ha China (PCRWR, 2015). The average water productivity of rice is 0.45 kg/m^3 compared to the world average of 0.71 kg/ m^3. In this case, rice alone consumes three times of the water storage capacity of Mangla reservoir - the country's largest dam. Similarly, sugarcane is grown on one million hectares, consuming 12 BCM annually, produces low yield sugar just because mill owners are powerful enough to keep growing this water thirsty yet highly subsidized crop. This is how skewed policies lead to unproductive use of scarce water resources in an arid country like Pakistan.

In Punjab province, the annual water fee is charged at a flat ($2.4 per hectare) since 2003. Water fee is based on the size of cropped land irrespective of the type of crop and the quantity of water consumed. Resultantly, the precious water is dumped in agriculture land for producing low value crops (wheat, sugarcane) at a high cost to the government (in terms of subsidy) and country (in terms of water scarcity). The policy reform should focus on curtailing water allocation to agriculture sector through rationalized pricing and other incentives (technology, market and trade) so that saved water could be shifted to other sectors (see value added water economy below) to increase economic return per unit water, ensures equity, environmental sustainability and security. The key towards this end will be favourable public policy supporting water pricing, trading and private sector investment.

4. DOMESTIC WATER ALLOCATION

Water supply service to domestic sector is primarily controlled by public sector and individual household owners (private pumping) in major cities, towns and villages. An obvious evidence of water scarcity could be seen through daily reports on electronic and social media showing people in cities grappling with water shortages. Karachi, the city of 20 million people, seems to be the first city in Pakistan which will run out of water in near future if current policies and management approaches continued. The water supply system in Karachi is facing serious issues such as constant or reduced water supply from hub dam, leaky pipes, mixing of sewerage water with piped water, power shortages in pumping stations and increasing demand. This gap in supply is filled by the hydrant mafia who sells water at exorbitant rates ($10 - 40 per tanker). Quetta, Lahore, Peshawar and other big cities are falling in line facing the same issues. Islamabad, the capital and first planned city, faces 50% water shortages. In addition, deteriorating water quality exposes 80% population to water borne disease. Long queues for water could be seen everywhere in major cities, amid frequent floods, which is an indication of a serious water service inflation (see Figure 2).

Figure 2. (Left) Water inflation in Pakistan; (Right) flood in 2010

Pakistan needs to learn lesson from the two recent examples of South Africa and India where water shortages have sparked a new discussion around the world – which city is running out of water and when? Recently, the city of Cape Town in South Africa was approaching the "Day Zero" situation where public water supply system was about to run

dry completely. People could get only 50 litres of water per household per day from designated points. Similarly, the local residents in Indian city of Shimla asked tourists to "stop visiting Shimla" because of the sudden crises of water shortage facing the city. The people in the city would get water only once in four days. Hotels purchased water at a rate of $6.5 per 1000 litres from tankers. The National Institute for Transforming India's recent report found that 600 million people face water scarcity, 75% households do not have access to drinking water and 70% of the water is contaminated. 21 major cities are expected to run out of groundwater as soon as by 2020 putting lives of 100 million at risk (NITI, 2018). This situation in the region is a wakeup call for Pakistan. In this context, Pakistan needs to put its own house (water sector) in order to avoid "Day Zero" like situation in near future.

On the one hand, Pakistan is a water scarce country where social, economic and environmental requirements are not met with predictable and reliable water supply service. This scarcity could be seen in terms of declining per capita availability and low storage capacity, deteriorating water quality and frequent spatial and temporal shortages faced by people almost everywhere. On the other hand, Pakistan cannot be termed water scarce country when it comes to frequent floods, wasteful agriculture water use pattern (rice & sugarcane) and free water service provision. Water scarcity in Pakistan seems to be a function of poor governance (market based allocation) rather than natural availability of water (examples of Netherlands, Israel and USA support this conclusion). Inclusive policy measures and technologies can reduce water consumption in agriculture significantly to be reallocated towards higher value end uses (domestic, industry, tourism and environment). A brief overview of water market in the following section will further highlight the misdirected water allocation system.

5. WATER MARKET IN PAKISTAN

5.1 Public Sector Water Pricing

Starting from public sector water pricing in agriculture sector of Punjab province, it is shocking to know that a farmer pays an annual water fee of $2.4 per hectare for irrigation of sugarcane crop. To make it simpler, a farmer pays less than one US cent as water fee for using 60 cubic meters of irrigation water (fresh snow and ice melt water from Indus River). Ironically, this free gift goes to the pockets of those farmers as well who earn huge profits each year through commercial agriculture farming owning thousands of hectares.

At the country level, the average water fee per hectare for cotton, sugarcane, rice, maize and wheat remained $2 - 4, $3 - 7.5, $2.2 - 3.7, $1.2 - 2.4 and $1.3 - 2.3, respectively, during 2001 to 2010 (GOP, 2012). Water charges of rice and cotton are almost same while rice consumes 60% more water than cotton. In Punjab province, the annual water fee charged at a flat $2.4 per hectare since 2003. Water fee collected on the basis of land cropped irrespective of type of crop and the quantity of water consumed. Generally the area assessed for water fee is half of the actual area sown. Then the actual collection of water fee is 60% of assessed amount. The revenue from water fee goes to the provincial revenue pool and hence there exist no relationship between water fee recovery and O&M costs. The average annual revenue from water fee collection in Punjab, during 2015-16, was $7 million which could cover only one-fifth of the minimum O&M requirements. Water fee in all provinces remained more or less stagnant over the last 15 years, although the price of wheat alone increased 400% during this period. Scarce water resources are used in agriculture sector for growing low value crops at a time when other sectors are facing water shortages.

Public sector provides domestic water is Lahore city at an approximate rate of 0.35 cubic meters (350 litres) per US cent with differential tariff (LDA, 2017). Businesses get 0.085 cubic meters (85 litres) per US cent for commercial purposes. Both domestic and

commercial sectors gets 0.085 – 0.35 cubic meters (85-350 litres) per US cent compared to agriculture sector which gets 60 cubic meters per US cent. The data suggest that there is a huge potential for revenue mobilization within the public sector water allocation if more water is transferred from agriculture to high value domestic and industrial uses (Figure 3).

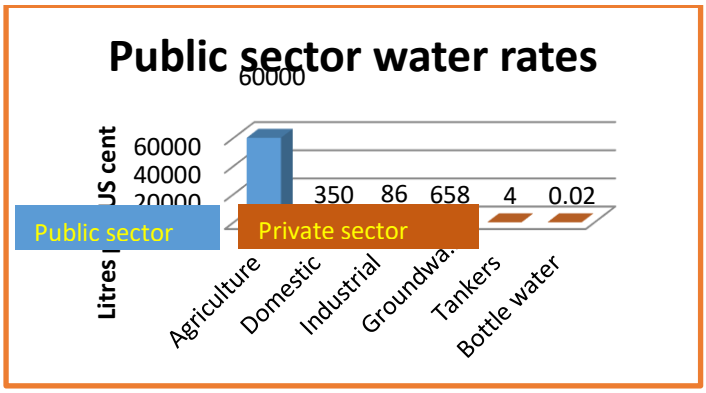

Figure 3. Water Pricing in Public and private sector of Pakistan

5.2 Private Sector Water Pricing

Private groundwater pumping for agriculture costs $80 - 160 per hectare per year in Pakistan. Using the same water per hectare for sugarcane crop, a farmer in Pakistan gets 0.658 cubic meters per US cent. This groundwater market mostly exists in irrigated areas supplied with public sector canal water as well. Thus, on the same farm, a farmer pays one US cent to get 60 cubic meters from public canals and 0.658 cubic meters from private wells. In plain words, public sector provides 90 times more water to a farmer, keeping same price unit, on the same farm compared to private well. This shows the water market distortion, although farmer willingness to pay (cost of (pumping) exist if reliable water service is ensured. Again a huge potential for additional revenue exists to capture this willingness to pay by either increasing public sector water pricing or shifting irrigation service to public private partnership mode.

For domestic uses, private sector tankers provide water at a rate of $7 - 14 per tanker (50 - 10, cubic meters capacity) in all major cities of Pakistan. Converting this data into simple equation reveals that citizens get 40 litres of water per 7 US cents in peak summer when public sector tapes go dry. These tankers use water from hydrants, mostly illegal and of sub-standard quality but yet highly demanding.

Last but most importantly, multinational companies sell one litre of bottled water at $0.35 all over the country (or 0.2 litres per US cent). No estimate exists as to how much it cost them to extract, treat and transport this bottled water. Now, it is up to the reader's imagination to compare the price of fresh water by public sector at the rate of 60 cubic meters per US cent for agriculture and private sector 0.02 litre per US cent for domestic use in the same market at the same time. An unimaginable potential of revenue exists which can be exploited with right kind of policies, market, technologies and infrastructure.

On global scene, Pakistan lies at the bottom in terms of water pricing. For example, farmers in Pakistan pay 0.001 US cent per 1000 cubic meter of water compared to 0.6, 0.12, 0.09, 0.05 and 0.02 in USA, Australia, Turkey, India (Maharashtra) and China, respectively. For a country like Pakistan, which is facing severe fiscal constraints, using precious natural water resources for free through highly subsidized irrigation and crop production is economic and environmental disastrous.

5.3 Is Water a Public Good or Private Commodity

Access to safe drinking water and sanitation was declared by UN as basic human right in 2010. Pakistan National Water Policy 2018 declared that "water is a strategic resource and access to affordable and safe drinking water is a fundamental human right of all citizens." Experts suggests a minimum of 50-100 litres per person per day as basic human right and any usage beyond this limit be treated as private good to be supplied at a market rate.

One major impediment to water market is its undefined property right. Water is considered as an open access resource, however, unlike other such resources (air, sun radiations) it is rivalrous (its use by one person deprive others from using the same unit of water) and excludable (a person at any time can be prevented from using water if not paying its fee – free riders). Currently, both surface and groundwater resources are tied up with land rights. Anyone who has land under a particular canal command the water right to access irrigation water. For groundwater, the land owners have unlimited access right to extract water. Citizens who do not own land, marginalized lands, drylands and uplands in Pakistan have in principle no water rights.

A strong opposition to water pricing is the general perception that pricing water will deprive poor because they cannot afford it. Let's see an example of electricity which is as vital as water for the modern world (without electricity, there will be no water in cities which uses groundwater). What if electricity is provided free of cost to consumers? Rich people with having access and technology (air-conditioners, appliances, heaters, tubewells) will be consuming more energy compared to the poor. On the other hand, when electricity is priced based on rate of consumption, as is the case in practice, the rich uses it carefully because of its exponential cost increases and that is why the poor too get their share. Same is the case of water; provide it free and the powerful will squeeze all of it. In Islamabad (personal experience) rich people installed additional pumps which suck water from distribution line (over and above their quota) leaving the downstream households with no water. Similarly, big landlord in Punjab and Sindh takes canal water (through illegal direct canal outlets) to flood their fields, depriving downstream smallholders their due share of water. This is how free water service is abused by the powerful for producing low value crops (wheat, sugarcane) at the cost of depriving poor to get their due share, inflicting huge economic and environmental cost to the overall society.

Looking at the agriculture sector, the cost of construction of dams, barrages and canal infrastructure is a public good and should be made from public money (general taxes) to achieve food security, employment and rural development for larger societal welfare. However, when this water enters into the private land, it increases benefits to individual farmers and thus it becomes a private good (rivalrous and excludable). The value of land and agriculture production increases manifold when it comes under irrigation service. Thus, a stream of public and private benefits is established simultaneously from irrigation infrastructure. The cost of service to private farms should be directly charged to the farmers, as water service fee, to meet operational, maintenance, management and up-gradation cost of the water system. The above discussion indicates that water could be public good as well as private commodity simultaneously which needs to be separated for larger societal benefits.

5.4 Rationale for Water Pricing

Now that we have determined that Pakistan is a water scarce country where available water resources are not managed properly to meet economic, social and environmental requirements and that water is a private commodity where it is used for profit or wasted, the next question that comes to mind is why it should be priced. Is the government benevolent enough to continue free supply of water for all sectors by internalizing the entire

burden of expenditure involved in the development and management of water storage, diversion, treatment, conveyance, distribution and disposal?

How can government ensure continuous, predictable, reliable, adequate and safe provision of water service free of cost? How can a country of 207 million people, facing severe fiscal constraints (negative balance of payment, higher debt-to-GDP ratio, lower tax to GDP ratio and 38% stunting rate in children below the age of five) can afford free water service to sectors such as agriculture which generate huge private profits? How can such the government maintain the world's largest contiguous irrigation system which is financially unsustainable (unable to recover cost of service).Can this precious and scarce resource be allocated towards higher value end use when it is free? Does the government know the opportunity cost (benefits foregone if it is used in other sectors) of irrigation water? Are poor, marginalized and smallholder the actual beneficiary of free water supply? Do all people have access to adequate, safe and reliable water supply in Pakistan – which is their basic human right? Answer to all these questions is a big "No."

The Government of Pakistan cannot ensure adequate maintenance of infrastructure and delivery of safe and predictable water service for all the people, all the times and at all places simply because it lacks financial and technical resources. 80% people get unsafe water. Poor and disadvantaged communities get water at a much higher price than rich people just because they cannot get public sector water service. This is why proper policy measures are required to price water so that answer to all the above questions could be changed to "Yes." Next section provides a way forward to answer some of the questions asked in this section.

6. The Way Forward

In context of national water policy" (GOP, 2018), emerging water crises and intensifying public interest, immediate actions needs to be taken by the government to transform water into an economic resource for domestic revenue mobilization and wealth creation. Water pricing, water trading and water allocation for economic growth should be one of the central binding factors of achieving water security, besides construction of dams (large, medium, small, ponds), distribution infrastructure, efficient technologies and awareness campaign. Some of the low hanging actions are summarized in the sections below.

6.1 Integrating Water Within Development Agenda

Currently, water is dealt as a standalone natural resource and allocated among sectors based on prior apportionment rights. It has not been included as an integral part of the development agenda so far. Now, that we all know it as a scarce resource and highly skewed to some usages (agriculture) at the expense of others and allocated without any consideration for productivity, economic growth and sustainability, it should be imbedded into the broad national development plan. It is recommended that water should be taken as a central piece for all development projects such as CPEC, housing schemes, tourism, health and Green Clean Pakistan etc. This policy will not only integrate water into development agenda but will also push agriculture sector to give up excess water for high value uses elsewhere in the economy.

6.2 Unbundling Water Rights from Land Rights

Currently, one of the biggest constraints in open trading of water among sectors is the undefined water right regime (licensing, allocation, entitlements for ownership, access, use, dispose and trade rights). The complexity goes on when it comes to water right quantity, quality, duration, security, flexibility, divisibility and transferability. The nature of water right as whether it is public, private or communal make the story further complicated. "A well-

defined system of rights is also the key to achieving a balance between the economic, social and environmental interests of the nation in managing water resources (Australia, 2003). Water is tied with land rights and hence cannot be traded as a separate commodity. Government needs to explore the option of water market potential and the unbundling of water rights from land rights so that its trading, both intra- and inter-sectroral, could be facilitated.

6.3 Water Trading at IRSA level

One of the first steps towards high value water allocation is the water pricing and trading at the Indus River System Authority (IRSA) level where water is allocated to the four provinces as per 1991 Water Apportionment Accord. Once an agreed upon water pricing ($ per BCM) and trading rules are established at IRSA level, provinces who take less than their share as per the Accord would be able to earn revenue through water trading. Provinces which use water share of other province(s) should pay a price for it. This revenue for the smaller provinces will be an incentive for further investment in high value water technologically efficient agriculture to save more water for further trading and revenue generation at IRSA level. This action will surely require an amendment to the IRSA Act 1992 for incorporation of water pricing and trading into the water allocation mechanism.

6.4 Bridging the Gap Between Costs and Revenue in Irrigation

The gap between irrigation system costs and fee revenue could be drastically reduced through the following steps:

- Phase wise increase in water fee rates (e.g. 200% in the first year, followed by 200% in subsequent year and then further increases based upon actual O&M requirements.
- Introduction of improvements in water fee assessment procedures (satellite imagery)
- Allowing Farmers Organizations to collect fee in advance with within their jurisdictions
- Establishment of Canal management companies to leverage private sector investment, skills and performance-based management to improve service delivery to citizens.

6.5 Value Added Water Economy

Following are some of the non-consumptive suggested actions to add value to water economy through better governance, management, investment and technologies.

- Government should rejuvenate the mighty Indus as a cultural heritage and economic engine. The Clean and Green Pakistan project should take cleaning of the Indus River, canals, drains and lakes as its integral part. However, this end could be achieved only if sewerage system is separated from natural water bodies through a separate storage, treatment and disposal system. Similarly, a recycling system for garbage collected from cities and towns will ease considerable pressure on natural water bodies where most of it is dumped today. This cleaning of rivers movement will create thousands of employment opportunities for youth on the one hand and reduce water pollution and health hazards on the other. Private investment should be encouraged to participate in this drive.
- Using canal water for domestic and industrial uses through contract between public and private sector, involving water users as shareholders in the whole process and

revenue sharing. It is recommended that water from irrigation canal water should be diverted to adjacent small reservoirs, treated and then supplied to the cities, towns, villages and industries on demand basis. All water users have to pay for the capital, operational and additional revenue for government through meter system. As already explained, there is a wiliness to pay among water users subject to the water service reliability. The water allocation to agriculture will slowly but gradually decrease through contracts between private sector/municipalities with farmers/irrigation departments. Water rights should be unbundled from land rights so that water could be transferred from one user to another through legal contracts. Contracts with farmers could be signed for water rights trading (temporary or permanent, seasonal and annual). Thus a stream of benefits will start flowing for all stakeholders; farmers will get money for the water they give up (temporary or permanent), which they will further invest in efficient technologies, practices and high value cropping pattern to save more water; government will save money that otherwise would be spent on operation and management (private sector will take care of canal system through a management contract with government); private sector will make money through reasonable profit; new jobs for youth; and above all safe, adequate and reliable water service for all citizens at a reasonable price will be ensured.

- Water from rivers and canals could be transferred to establish parks with restaurants and playgrounds for youth and children. Government will contract out these parks to private sector and hence revenue will be generated, part of which will go to farmers who gave up water and the rest to the public sector revenue pool. Private sector will earn from restaurants, play stations, park fee, shops etc. A healthy economic and recreational activity will take place just by using the water that otherwise would end up in fields and drains without producing economic benefits.
- Rivers and canals in Pakistan have the potential for power generation by utilizing the velocity of the flowing water for generation of electrify. Small generator with rotating wheels could be placed in rivers and canal for producing hydropower at small scale. For example, Ghazi Barotha power channel which is 52 kilometres long concrete canal with a velocity of 2.3 meters per second could be used for similar flow-based power generation quite effectively.
- Pakistan lies in a temperate zone with long and hot summers. People all over the country go to the rivers and canals for swimming when the blistering heat starts falling in summer (Figure 4). Government should open up canals for private sector to build cascade of swimming pools, preferably by using gravity, in adjacent areas. The area surrounding these swimming pools should be developed with trees, shelters, walking tracks, restaurants, marriage halls and parking facilities to attract visitors, including families. Thus, with small private sector investments, simply diversion of river or canal water (that will flow back to the channel without being consumed) will create economic activities, jobs and recreational opportunities.
- The federal government project for building 5 million low cost housings for poor should be linked with freshwater by using the nearby canal and river waters to pass through the housing areas so that scenic view and cool environment could be developed. Rainwater harvesting should also be made an integral part of the new project so that several water bodies (lakes) could be developed for parks, swimming pools, to increase value of the land and creation of a healthy environment. Again, this activity will not consume water and yet will produce huge economic and environmental benefits.
- There is a great potential of water eco-tourism in areas served by rivers and canals. The new government strategy for promotion of tourism should take water as its central piece. Pristine water valleys should be promoted as tourism destinations by making investment in cleaning and using fresh water bodies as

attractions for tourists from all over Pakistan and around the world. Sea ports, Northern areas, AJK, Northern KP (Swat, Dir and Chitral), Orakzai tribal district, South Waziristan, Ziarat and many other places have huge potential for eco-tourism around water bodies.

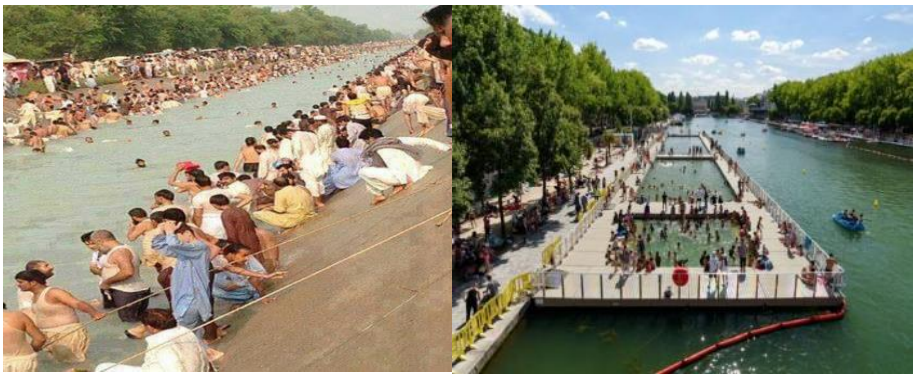

Figure 4. (Left) Pehure high level canal in Pakistan; (Right) potential swimming pools

7. CONCLUSIONS: INCENTIVES FOR WATER SAVING

All reforms needs to be strongly imbedded with an incentive structure to promote behavioural change, and develop due processes and systems for water efficiency, productivity and improved water service. This could be achieved through, inter alia, the following steps.

- Achieving water efficiency and productivity will require better water measurement equipment at all points (trans-boundary, reservoir, canal heads, watercourse head, housing and industry level) with incentive structure including subsidized technology and credit and enabling environment for water market where “Saving shall earn credit.”
- Encouraging private sector and community initial investment in improved water service, followed by government and donors’ support to investors on the basis of efficiency and productivity targets achieved.
- Linking water reforms with the institutional reforms
- Water policy is in fact water administration. Irrespective of how fancy a policy is drafted; its real test lies in implementation. Pakistan used to be a country where all kinds of reforms recipes have been introduced but when it came to implementation, the result remained seldom satisfactory (PIDA reforms, land reforms, productivity reforms). The reason is simple yet highly complicated. The actual players (who implement reforms) and the rules of the game (processes) remained unchanged. The system of reward and punishment is lacking. In this context, all the above reform agenda for transforming water resources into a high income commodity/service will require reforming the laws, rules, implementing agencies’ charters and ownership, capacity building, coordination, management, service delivery targets, water pricing, water market and accountability.
- Achieving water security in Pakistan will require political will, supported by consistency in policy and professional efforts. Public interest such as shown by the media and civil society activism will add further pressure on political and technical folks to keep moving steadily but surely.
- Last but mostly important, all reforms should be supported by a strong and rigorously evidence. Based on the famous quote that “knowledge without policy is

nothing and policy without knowledge is gambling," all reforms should be supported by research as a knowledge powerhouse for decision makers.

Disclaimer : The views expressed in this paper belong to the author and do not represent the views of the USAID to which the author is associated.

Conversion rate used: (1 US$ = 140 PKR)

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