Abstract-ID: 241 - Water Pricing for Conservation, Sustainability & Climate Change

This working paper aims to develop recommendations for deriving efficient, cost-effective and affordable solutions for safe water provision and pricing in rural areas of Punjab through assessment of tariffs and functionalities of current and planned water schemes. It includes review of proposed legislations on the use of municipal water and analysis of 'willingness to pay factor' for which awareness on benefits of safe water use is integral. It is authored by Ayesha Bilal (Research Associate, Punjab Saaf Pani Company) under the supervision of Ali Salman (Member, Board of Directors, Punjab Saaf Pani Company).

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Introduction

Since water holds fundamental value of survival of all living things, it is nothing but natural that this subject is very sensitive to debate on. Provision of safe, clean water is considered a basic human right which makes its commoditization seemingly unjust. However, as Segerfeldt (2005)[1] argues, when more than a billion people lack access to clean and safe water and so many of them die due to water borne diseases, there has to be something lacking in this philosophy.

As narrated by Kugelman, the recent IMF report declares Pakistan as the third most water-stressed country of the world with the fourth highest rate of water use and the highest intensity rate (the amount of water, in cubic metres, used per unit of GDP)[2]. Therefore, pricing for water conservation is not just an option but a necessity in a country like Pakistan.

True, water is necessary for survival, but so if food – something commoditized since beginning of time. Through successful examples of communities who have chosen to privatize water provision, Segerfeldt quite sensibly explains that privatization of water

[1] Segerfeldt F (2005). Water on Sale; How Business and the Market Can Resolve the World's Water Crisis, CATO Institute, Washington DC

[2] Retrieved July 14, 2015, from http://www.dawn.com/news/1191022/nightmare-scenarios

will allow market forces to come to play so supply can meet demand. Since privatization also means customer satisfaction, more care will be taken on providing "clean" water. Of course partial intervention is necessary for let us say the disadvantaged or farmers who produce essential crops with water or to curb any misuse of power over water provision – but by and large water distribution needs to be open for privatization to eliminate shortages.

Hence, this study relates willingness to pay with the current scenario of water availability and pricing to show that communities that lack water provision in Pakistan need to adopt a model where the government's role is only limited to providing a source and network for water. The distribution needs to be community driven where users pay for water use. Better service and quality of water will automatically justify tariffs – especially if the money collected is being used for the community and by the community itself. Priced water will also be used more cautiously which will eventually reduce wastage.

Punjab Saaf Pani Company (PSPC) – An Institutional Response

The Punjab Saaf Pani Company (PSPC) has been established as a Special Purpose Vehicle (SPV) to conceive, plan, design, execute and manage projects for provision of safe drinking water to the communities living in underserved areas of Punjab (i.e. rural and peri-urban areas of the province). Incorporated in March, 2014, under the special initiative of the Chief Minister of Punjab, Government of Punjab, the Punjab Saaf Pani Company has adopted an elaborate exercise of Evidence Based Need Assessment to ensure sustainability of water supply schemes. PSPC is planning to prepare a Master Plan for sustainable safe drinking water solutions for the rural, semi-rural and peri-urban population of the province in a comprehensive and integrated manner. Along with selecting dysfunctional schemes for rehabilitation and up-gradation, construction of new water supply schemes, filtration plants have been proposed (60% filtration plants and 40% mixed solutions). [3]

This paper shall explore the options for water pricing and provision that PSPC may adopt for sustainability of the water supply schemes.

Situation Analysis

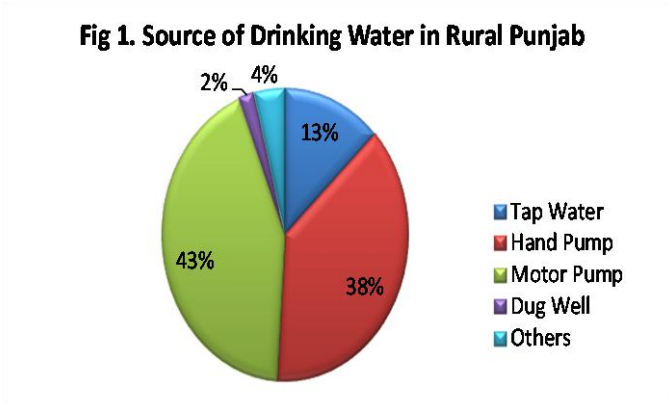
The province of Punjab consists of 36 districts with 25,914[4] villages overall. 97% of the people in Punjab have access to drinking water, out of which 49% is contaminated and 20% live near arsenic "hot-spot" districts which is exposed to arsenic contamination above World Health Organization's (WHO) safe level of 10ppb[5]. Sanitation exists in only

[3] Retrieved July 14, 2015, from http://www.saafpani.punjab.gov.pk/
[4] Ibid.
[5] *State of Water & Sanitation In Punjab; Position Paper*. (2011). Punjab Urban Resource Center.

in 6% of the villages and where there is no sanitation, people use septic tanks attached with their toilets. Portion of waste in these tanks goes in *nalis* (open water pathways on street sides), while the other portion is disposed – not properly though. Hence major contamination of water is through rugged pipes used in sewage and these septic tanks and *nalis.*

The Public Health Engineering Department (PHED) provides water services to Rural and remote urban areas of Punjab – which is done so through "user committees" comprised of a few selected residents of the village. Water and Sanitation Agencies (WASAs) exist in five Urban districts, namely Multan, Lahore, Rawalpindi, Faisalabad and Gujranwala while the other Urban districts are managed through the districts' respective Tehsil Municipal Administrations (TMAs). Out of the 4,069 water schemes introduced by PHED in Punjab, 35% and 32% schemes are non-functional respectively in northern and southern part of the province due to failure and engineering flaws.[6]

Out of the water and water schemes and private sources available in rural Punjab, Figure 1 shows the 'source of drinking water'[7], as per the Pakistan Social and Living Standards Measurement Survey 2012-13:



The graph shows that only 13% of water used for drinking is tap water suggesting a very low usage of 'piped' water supply schemes in the province. In contrast, 81% of the households use a motor pump or a hand pump – a self-financed, off-grid solution people seemingly prefer using in the province.

According to a study by Babar Chohan in 2007, almost Rs. 101 billion is being spent because of either direct or indirect implications of waterborne diseases in the Punjab Province alone. Moreover, the annual cost under the head of averting expenditures, in lieu of bottled water and boiled water, has been estimated at Rs.2.4 billion[8]. This naturally suggests that these costs must have hugely increased for 2014-15.

[6] Ibid.
[7] Pakistan Social and Living-Standards Measurement Survey (2012-13). Retrieved July 14, 2015.
[8] Retrieved July 14, 2015, from http://www.saafpani.punjab.gov.pk/

Current Pricing Models and their Challenges

Flat Rate

Tariff for water and sanitation in Punjab is largely based on flat rate. Bills are issued either according to property size or type of use i.e. domestic, industrial or commercial. Flat bills vary from 72 to 800 rupees with only 25%-40% collection efficiency. WASA Rawalpindi charges Rs. 98 per connection which nowhere near what is required for cost recovery, especially considering the fact that government does not provide any funds for O&M. A very small percentage pays marginally higher for larger properties.

Tehsil Municipal Administrations provide piped connections in small towns in their respective areas where they are also responsible for running filtration plants in the locality including its O&M. They charge a flat rate of no more than Rs. 80 to Rs. 90 which is again extremely low and not enough to cover the costs incurred for water provision overall. TMAs have to generate their own funds from small retail shops and other taxes collected locally.

Apart from the capital and O&M costs, high electricity bills and load shedding bring forth additional challenges in smooth operations of water schemes. Neither WASA nor TMAs are able to provide continuous water supply to all houses.

Housing societies also use a flat rate for water use which is a part of a composite bill issued in lieu of the services provided by the society.

Meter Rate

Use of meters can be extremely helpful in conservation of domestic water use. Unfortunately, functional water metering is present only 12% in Lahore, 6% Rawalpindi and 1.8% in Faisalabad.[9] Meter rates have been reported as low as Rs. 35/unit in a rural water supply scheme in Chak Jalal Din (Rawalpindi District), where 1 unit is approximately 1000 liters.

Use of Meters has not been successful in the past due to lack of accountability and maintenance. According to a WASA official, a scheme was introduced not so long ago where 5000 meters were installed in a town in Rawalpindi. Due to theft and intentional removal of meters, only 1700 remained intact after 3 months. Eventually, these 1700 could not be kept functional due to extreme negligence and no ownership. Rare successful examples of metered schemes exist only when community ownership is in place.

Hence, even though use of meters is theoretically ideal, like any intervention it also needs a proper system of accountability and maintenance for sustainability.

[9] *State of Water & Sanitation In Punjab; Position Paper*. (2011). Punjab Urban Resource Center.

Metered Water Scheme in Rawalpindi

During our visit to a recently urbanized village of more than 600 households named *Chak Jalal Din,* 10-15 km away from the main city of Rawalpindi, we witnessed every house connected to a water meter. Though filthy and outwardly worn-out, the meters were all pretty much functional – installed four years ago by the user committee that used to run the scheme before WASA Rawalpindi took over last year. These meters record the use of water by each household where users are charged at 35 paisas per unit (1 unit equivalent to 5 drums or 1000 liters).

According to WASA officials, water is provided to all the 600+ households through a single tube well every second day just for 45 minutes – hardly filing up 2 drums of water for a family of 6-8 people – although residents claim the actual water collected is much lesser. Water is rationed such that only 50-60 households connected to a single valve are provided water at one time. A valve manager decides which valve to open when depending on how much water is collected everyday in the overhead tank through the tube well so as to formulate a schedule for all the households in the village. The valve manager is himself a member of the community hired on a minimum wage by WASA Rawalpindi.

In times of technical issues causing tube well's closure; water has to be bought by private tankers costing Rs. 600 each that can approximately serve eight people for three days. On the day of our visit, we discovered that the water supply from WASA had been disconnected for the last 10-15 days during which the residents had to rely on private tankers, paying a total of around Rs. 2000 – Rs. 3000 to fulfill their water need.

Hence, even though water is supposedly provided by the government at exceptionally nominal rates, its quantity is grossly insufficient – even if a fully operable tube well is providing water as per designated schedule. Frequent issues in the tube well's functioning become a further nuisance for residents forcing them to "buy" water at a much higher rate to fulfill their everyday water use. Moreover, although officials claim that the water provided is potable; residents do not seem to

trust the quality of this water and have to fetch drinkable water from a nearby well – further increasing their cost of water use.

The mere reason for meter installation is water conservation, but when water is provided after 2 days only for 45 minutes which is not even considered drinkable, is it really any different from charging residents a flat rate? The aim should be to provide continuous "access" to water instead of this general aversion of putting a price to water which is already being bought and sold through informal, unregulated markets.

Changa Pani

Juxtaposed to the usual water provision schemes, a novel program that addresses the water crisis in Pakistan is 'Changa Pani Program' (CPP) – a unique solution originated by Mr. Nazir Ahmed Wattoo (Founder Anjuman Samaji Behbood) currently prevalent in Bhalwal, Sargodha, UC-60 Lahore and WASA Faisalabad. It works on the "component sharing model"[10] – which basically means that after government provides with a basic infrastructure of water source (ground/surface) connecting to a piped network, the community shares the burden of building an 'internal component' for themselves which includes building toilets and pipe fitting for water supply and sewage pipes from the main lines to the houses[11]. This component is not only built by the community, it is also managed by them, where lane managers are appointed within the community. Households share the cost of the internal component and pay tariff for water use once the system is in place. In Bhalwal, the tariff is based on meter rate[12] while UC-60 Lahore uses a flat rate.

CCP is an excellent model showing how public private partnership can be successful to involve communities so they can *own* the water supply scheme. CPP model may be taken as a benchmark to successfully implement water pricing by PSPC.

Fate of CDWI and CDWA: Lessons to be Learnt

As part of the National Environmental Action Plan, Ministry of Environment initiated a major Clean Drinking Water Programme approved in 2004 to be carried out in two phases (i) the Clean Drinking Water Initiative (CDWI) project where 409 plants have been installed one in each tehsil across the country, and (ii) the Clean Drinking Water for All (CDWA) project where 6035 plants were to be installed, one in each council.

[10] *Changa Pani: An Urban Water and Sanitation Solution -— Early impacts and essential responses*.
[11] Ibid.
[12] For Domestic: 5pc/gal for first 1000 gallons, 7pc/gal for next 1000 gallons, 10pc/gal for more than 2000 gallons of water consumption. For Commercial: 7pc/gal for first 1000 gallons, 10pc/gal for next 1000 gallons, 13pc/gal for more than 2000 gallons of water consumption. Line Rent @Rs. 50 for all domestic and commercial users.

CDWI was approved at the cost of Rs. 495 million, which had to be later revised to 955 million[13] after necessary consultations. The summary of work done under CDWI can be seen in the following table:

Table 1: Number of filtration plants installed under CDWI[14]

Sr. No	Province/Region	Plants Installed
1	NWFP	54
2	FATA	8
3	PUNJAB	116
4	AJK	21
5	NAs	6
6	SIINDH	101
7	ICT	1
8	BALOCHISTAN	102
Total	All Provinces/Regions	409

On the other hand, the CDWA was allocated around Rs. 7.8 billion since it involved installation of plants in each council. This project was approved in 2006 where ninety-nine remaining plants from CDWI were later included as part of the CDWA project which meant that a total of 6585 plants had to be installed. Given the experience from CDWI, technology and implementation methodology of CDWA was improved. However, the project lacked coordination between the government, the relevant authorities and the contractors awarded contracts for the plants' installation; hence lack of sustainability which is why it could not be completed. It was also found out later that many of the plants installed under the CDWI project did not remain operational for long.

The major lessons learnt from both these projects include the following[15]:

- Lack of ownership: TMAs and local user committees were not involved in the project during installation and also not given any responsibility for the functioning of the filtration plants. This eventually led to negligence in plant's O&M making many of them non-functional.
- Filtration plants were not installed based on need: A proper survey should have been conducted if the community even needs the plant since in some areas water from tube well was perfectly potable
- No awareness raising campaigns: Colorless odorless tasteless water is mistakenly assumed to be safe for drinking in Pakistan. Awareness campaigns were necessary to inform the people and communities that water that looks, smells and tastes ok is not necessarily safe to drink.
- No recovery of O&M costs: of the plants that were installed as part of CDWA, there were no tariffs imposed on water consumed hence there was no system of

[13] Poverty Reduction Strategy Paper - II. (2010). *IMF Staff Country Reports*
[14] Ibid.
[15] Pakistan Safe Drinking Water and Hygiene Project; Final Report. (2010). *USAID Pakistan*

recovery of at least the operations and maintenance costs. Although the government promised to cover these costs once the TMAs took responsibility of the plants, these promises could not be practically realized and no one was willing to take responsibility of the plants' operations.

Legislative Developments

Proposed legislations such as the Punjab Drinking Water Policy, Punjab Drinking Water Strategy 2012 and The Punjab Municipal Water Act 2010 (Draft) can prove useful to uncover the issues of water scarcity and its many aspects so as to devise a comprehensive policy paper/legislation for clean drinking water provision that PSPC can use as a foundation of its mega project.

The Punjab Drinking Water Policy (PDWP) presents the basic guidelines to be adhered to for provision of safe drinking water in the province of Punjab. It describes in detail the water related problems in the province and the general principles that need to be kept in mind when devising a policy for water provision and conservation such as necessary use of tariffs and meters. It also outlines the role and responsibilities of the concerned departments for water provision such as PHED and TMAs. The Punjab Drinking Water Strategy (PDWS) is an extension to the PDWP such that PWDP identifies the issues and the PDWS illustrates the 'Action Plan' to combat these issues. It gives a detailed account of the problems being faced in the five WASAs in Punjab and how these can be overcome. The gist of both these drafts is the need to devise and implement an efficient solution to the water crisis, including imposition of an appropriate tariff system.

On the other hand, the Punjab Municipal Act 2010 (Draft) is a comprehensive piece to evaluate the role of the government in water provision and it justifies enforcing a tariff system with suggested mechanisms to impose and regulate it. For example, the Act states that every Local Government in the province has a duty to ensure efficient, affordable, economical and sustainable access to water services. Also, the Punjab Municipal Commission (which is yet to be formed) shall set standards of water quality and quality of services delivered which will ensure efficiency and equitable access to water services. The commission will also be responsible to carry out research for conserving, improving and extending the water sources/services in the province. For imposition of tariffs, the Act proposes formation of Community Based Organizations from within the community members which can regulate the tariff system and ensure standards are met. The tariff system can be different for different categories of users or water schemes or even different geographical region, however, it should be based on principles of equity and sustainability of water which are not in conflict with the standards suggested by the commission. It is also stated that installation of a measure for water use is compulsory for all municipal water users.

"Willingness to Pay" and Significance of Raising Awareness

Given the scarcity of water due to inefficiencies in both the demand and supply side and the immense costs it incurs in terms of health expenditure and everyday expenses of 'fetching' safe water, a sustainable pricing model needs to be in place which not only covers costs of the water schemes provided but also ensures sustainability of the scheme with minimum wastage by consumers through assessing their 'willingness to pay' (WTP) – the maximum sum an individual is willing to pay for a good or a service, which in this case is clean water. Without analyzing WTP, deriving a suitable tariff and enforcing it can be next to impossible. A good measure of WTP along with its determinants can largely affect not only the pricing model but also the policy implications needed to implement that model.

To understand WTP and factors influencing it, case studies of Abbottabad[16] and Peshawar[17] have been reviewed. Both studies included households from rural as well as urban areas and used the Contingent Valuation Method (CVM) and the Averting Behavior Approach to calculate the WTP in each case and analyze what factors significantly affect this WTP factor.

Following can be deduced based on the Abbottabad case study:

1. Water services and its quality both are of value to the consumers such that they are willing to pay for improved water services and quality;
2. Residents of urban areas have a significant and higher WTP factor for improved water services
3. Education level significantly affects WTP for safe drinking water
4. Awareness has an effective role in influencing the general public perception towards the opportunity cost of using unsafe water

On the other hand, the Peshawar case study mainly concludes that education and awareness especially through media (print/television) and other awareness campaigns significantly affects WTP factor for improved water services. It suggests that awareness campaigns through media, NGOs or local communities can be extremely beneficial for spreading knowledge of hazards of using unsafe water and therefore convincing members of the community to pay nominal charges for safe and clean water. Moreover, since women are responsible for the water purification methods at home, educating women of these hazards can have manifold benefits for the society.

To analyze whether demand changes if water tariffs are increased, a study was conducted in Lahore[18]. It was found out that demand for water is fairly inelastic, which means that increase in tariffs will not significantly decrease the use of water (although it

[16] Haq, M., Mustafa, U., & Iftikhar, A. (2007). *Household's Willingness to Pay for Safe Drinking Water: A Case Study of Abbottabad District*. The Pakistan Development Review.
[17] Iftikhar, A., Haq, M., & Sattar, A. (2010). *Factors Determining Public Demand for Safe Drinking Water (A Case Study of District Peshawar)*. PIDE Working Papers.
[18] Rauf, T., & Siddiqi, M. (2008). *Price Setting for Residential Water: Estimation of Water Demand in Lahore*. The Pakistan Development Review.

may reduce wastage). Therefore, to increase revenues, WASA or local provider of water may charge higher prices to fill their deficit gaps. As per WASA official, some villages have reported tariffs as high as Rs. 400 per month which is even higher than urban areas, but the villagers happily pay this amount to get clean drinking water in their homes.

Therefore, successful introduction of a water provision and pricing system will truly only be possible if the community is educated on the benefits of using safe water for their families. Consumers need to be convinced that a small price for continuous safe drinking water provision is far better than intermittent, unsafe free drinking water – so to speak, since this water brings with it opportunity costs of health problems. In many cases, people are actually paying for fetching water from outside of their communities which is still not reliable in terms of drinking. Therefore, a massive media and educational campaign – which positively affects *willingness to pay* as per examples above – will have to be launched to instill the need for easy access to safe water for everyone and why it is justified to pay for it. The campaign must also outline social responsibility of each citizen to take good care of the water scheme installed and use it as their own. It is only then that a water scheme may be successfully implemented.

People Willing to Pay for Uninterrupted Water Supply

About 18-20 km off main GT road towards Chakwal, there exists a serene village named *Manghot*. We visited this village to observe the functioning of a unique water scheme providing piped water to around 60-70 households. The water source is a small dam comprised of accumulated rainwater which is connected to a pump that draws water for all the connected households. Water is provided daily for two hours so that households can fill up their underwater tanks and use it throughout the day for cleaning and all other uses except for drinking. Potable water has to be fetched from a well in a village nearby.

The water scheme is managed by the local user committee comprised of five people from the community. This committee collects a flat rate of Rs. 200 from each household where the collected money is used to pay the electricity of the pump, salary of the labor hired for operating the pump and minor repair and maintenance that may be needed time to time.

According to a user committee representative, people willingly pay for water use and will be willing to pay higher if this water can also be used for drinking since it will reduce the hassle of fetching water every other day.

This is a good example of illustrating that people are not only currently paying, but are willing to pay higher for better water quality and services.

Introducing Water Tariffs

Based on the analysis above, it can be concluded safely that there is a dire need for an efficient, sustainable pricing mechanism that should be urgently implemented to ensure water conservation and clean water availability for all. While giving suggestions to the water crisis in terms of implementing tariffs, Shahid (2005)[19] stresses on Private Sector Partnerships (PSP) – as was also proposed in Punjab Drinking Water Policy. He states that the private sector "can help in the production of low cost technologies and in the social marketing of sanitation and water treatment equipment", however, he also warns that while PSPs may be a good idea for water distribution and tariff collection, the sources of water should be controlled by the government. PSP also does not imply that there should be no subsidies, the poorest in remote areas or massive users of water such as farmers, may still be entitled to subsidies. Moreover, even in PSP prevalence, ALL residents have to be guaranteed a minimum quantity of water. Similar ideas have been put forward by Segerfeldt (2005)[20] in his book "Water for Sale" where he establishes the argument of treating water as an economic good which has a certain utility and can be bought or sold – something that can automatically lead to equilibrium price setting of water through market forces. He also suggests that given the nature of water use as a basic human need, even if commoditized through privatization, water provision should be regulated.

For a successful solution to the water crisis, Khurram Shahid (2005) suggests that given the deficit under which PHED/TMAs/WASAs are running with ever increasing number of defaulters, the tariff system needs to be increased and the system of collection of these tariffs needs to be more efficient. Therefore he suggests:

- Since tariffs are performance linked, increase in tariff will only be welcomed if water provision is quality is improved simultaneously.
- Tariff increases must allow for inflation and general increase in electricity costs as well as reflecting realistic operating and maintenance expenditure
- Tariff increases have to be realistic but at the same time affordable. "User pays" policy needs to be adapted by the government

[19] Shahid, K. (2005). Drinking Water and Sanitation Sector Review of Policies and Performance and Future Options for Improving Service Delivery. *Country Water Resources Assistance Strategy, Background Paper # 8*.
[20] Segerfeldt, F. (2005). *Water for sale How Business and the Market Can Resolve the World's Water Crisis*. Washington D.C.: Cato Institute.

- Initially, water service providers should aim to recover revenues sufficient to cover recurrent (operating and maintenance) costs leaving aside capital costs for renewing or expanding infrastructure.
- Instead of subsidizing tariffs, usage or connection charges may be subsidized to help the poor section of the communities (they already pay more than they would have for a piped water connection)
- Costs need to be reduced while revenues need to be increased. The costs may be reduced by: better management, sound O&M, opting for least cost options, and better financial planning while revenues can be increased by: Increase billing and collection efficiencies, reducing Non Revenue Water (NRW), better pricing, and improving the delivery service so there is more willingness to pay

Apart from these, the PDWP proposes that the water quality provided through any scheme introduced needs to (a) follow National or World Health Organization standards; and, (b) should be provided based on the notions of social equality and justice.

Dr. Imdaad Hussain in his book "Thirsty Cities: Analyzing Punjab Drinking Water Policy"[21] correctly points out that although the PDWP touches upon equality, it does so only in terms of prioritizing water provision for disadvantaged geographical areas. It does not cater to the social, religious and cultural disadvantages. Therefore, during installation of a water scheme, special provision needs to be made for the disadvantaged population in these aspects.

Moreover, in practical terms, the tariff to be charged and willingness to pay will be largely dependent on the satisfaction of rural population of Punjab with the current water service and quality being provided. If these dwellers are happy with the current scheme and tariffs it is unlikely that they will welcome any changes. Therefore, to correctly devise a pricing mechanism and water provision scheme, a survey of villagers about their opinions about the current scenario should be undertaken.

The Proposed Solution

Proposed Model for Rural Water Provision for PSPC

To supervise regular maintenance, operations and management of water use through these schemes, it is proposed that PSPC forms "Saaf Pani Committees" for each scheme i.e. a group of responsible people appointed from within the community and by the community which may include people from pre-existing "user committees". This committee may then hire an "Operations Assistant" i.e. trained person within the community to handle the day to day functions of each scheme including door to door distribution of water bills and ensuring due payment, managing complaints, water rationing and so on. The committee will be responsible for handling and safety of cash.

[21]Hussain, I. (2012). Thirsty Cities: Analyzing Punjab Drinking Water Policy. *Punjab Urban Resource Center*.

Water may be collected by the residents of the village directly from the filtration plants using personal water containers. Hygienically safe containers may be provided as per quota for each household at a later stage. PSPC may introduce pre-paid cards which will help in accurate measurement and delivery of drinking water as per the household needs.

To successfully implement these schemes and raise willingness to pay, it is recommended that the interventions be accompanied with awareness raising campaigns through local media and schools/colleges of the area.

Successful Rehabilitation of RO Plant through Community Mobilization

Reported by Salman Nazar, Regional Manager DGK (Package 3), September 2015

A reverse osmosis (RO) plant funded by the "King Abdullah's Relief Campaign for Pakistani People" in collaboration with "State Development Organization Pakistan" was installed in a village named Hassan Pur Trund (Muzaffargarh) a couple of years ago, serving around 150 households. Upon PSPC team recent survey facilitated by the local social management consultant (SMC) *Mojaz Foundation*, it was discovered that this plant had been dysfunctional for the past 7-8 months. The total cost of the plant with the capacity of 1000 gallons has been reported around Rs. 2,000,000, with a maintenance cost of no more than Rs. 10,000 per month. The plant is located in a school where the taps face outside the school boundary. While functional, the electricity bill was borne by the school voluntarily.

Even though a proper committee was formed when the plant was first installed which was responsible for the operations of this plant, it failed to function due to lack of sustainable measures. The donors of the plant provided the committee with a limited stock of filters that had to be changed periodically and the chemical used in the filter could not last more than a few months. With no more filters to replace and the vital chemical utilized, the plant eventually stopped working after a year or so.

It was then decided that the repair cost of the RO plant will be determined which will be collected from the community since the community itself is a direct beneficiary of the plant. The most active member of the previous committee was contacted by PSPC team and with his help a new Saaf Pani Committee (SPC) has been formed which include a few old members. This SPC has a separate bank account for collected tariffs.

Technical expertise was sought from a team in Multan which visited the plant and deciphered that the cost of repair will be around 25 to 30 thousand rupees. Community was then mobilized by PSPC team and SMC to collect 28 thousand rupees to rehabilitate the plant.

The plant is now functional and the community has decided that each household will pay a certain tariff per month for its operations and maintenance cost. The members with bigger houses will pay Rs. 100 per month (30 households) while the ones with smaller houses will pay Rs. 50 (50 households). Others did not agree on a fixed rate but promised to pay whatever they may be able to at the time.

A significant number of filtration plants exist in the Package 3 region that can be easily renovated without incurring high costs. PSPC should invest in *rehabilitation* instead of installing new plants that way PSPC will save on money and time. Community can benefit from the dysfunctional plant within a few days through rehabilitation instead of waiting for a new plant to be installed. MoUs can be signed between the community and local government to maintain the operations of the plant.

Risk Analysis

The solution proposed for PSPC may face the following issues that can pose a risk to the overall success of the project:

- Community engagement
  Since this kind of water solution is new to Pakistan, building community's trust about its worth and making them understand why their contribution is necessary for the sustainability of this scheme can be a huge challenge. Hence the need for awareness campaigns through schools and active community leaders and organizations.
- Local government cooperation
  The desired solution cannot be implemented unless the local government is fully on board since they have to oversee the operations of the water supply schemes and provide technical expertise where required. If the local government is convinced that this project will actually help them sharing some load without undermining their authority this venture can be successful.
- Timely payment of water bills

Households generally have an aversion towards the hassle of paying any kind of utility bills which is why the case of water bills may not be very different. If the billing system is made user friendly, households may be regular in payment of water bills.

Setting a Tariff

While devising the solution to be adopted in the rural and peri-urban areas of Punjab the various aspects listed in the earlier section on introducing tariffs need to be considered as well as the relevant costs and willingness to pay of the residents of the locality. Since survey results for WTP are not yet available, the following tariff deduction is based on costs and principle of equity.

EXAMPLE 1: Priority Tehsils, Bahawalpur

This model includes simple installation of 93 UF filtration plants in priority tehsils of Bahawalpur that can cater to a population of 330,000.

Given the high capital and depreciation costs these water schemes entail, it is proposed that the tariff devised only reflect the following 'running' costs:

1. Operations and Maintenance (O&M) costs;
2. Consultancy by EMC costs;
3. Social mobilization cost;
4. Management supervision cost;
5. Electricity bills;
6. Labor charges/salary of "Operations Assistant"

Tariff charged will be set per liter of daily use and this will be the same for all people using a particular water scheme in a specific village/town. To keep room for unforeseen expenses, 10% of the revenue can be collected as "savings" for a specific scheme. Cross subsidy may also be embedded such that costs incurred shall ensure water access to all but revenue generated through tariff will only be collected from users who are able to pay.

Following is an example to illustrate how total costs can be used to determine water tariff for one filtration plant in Bahawalpur catering to a specific number of people:

Based on PSPC intervention by filtration plants in priority tehsils in Bahawalpur, the table below shows distribution of costs incurred per plant per month. It shows that the revenue collected through proposed tariff may not only cover the major variable costs but also enables saving of 10% which can be used for repair and maintenance over and above expenditure allocated for O&M.

Assumptions

1. A household has an average of 6.7 people.

2. Each person uses 3 liters of water per day.
3. About two-third of the population actually use the filtration plant on a daily basis.
4. One-third of the population may not be able to bear the water tariff, however, they will not be denied of the facility.

Table 2: Tariff calculation for a filtration plant based on monthly costs incurred

Population served	**3,548**
Population using water (2/3 of total)	2,366
O&M Cost (Rs.)	41,667
Consultancy Cost EMC (Rs.)	10,454
Social Mobilization Cost (Rs.)	1,045
Management Supervision (Rs.)	896
Labor Cost (Rs.)	15,000
Electricity Bill (Rs.)	10,000
TOTAL COST (Rs.)	79,062
Cost per person (Rs.)	33
Cost per person per day per liter @ 3 liter per day use (Rs.)	0.37
Tariff after 10% saving (Rs.)	0.41
Revenue per household (2/3 of total) (Rs.)	249
TOTAL REVENUE (Rs.)	87,847

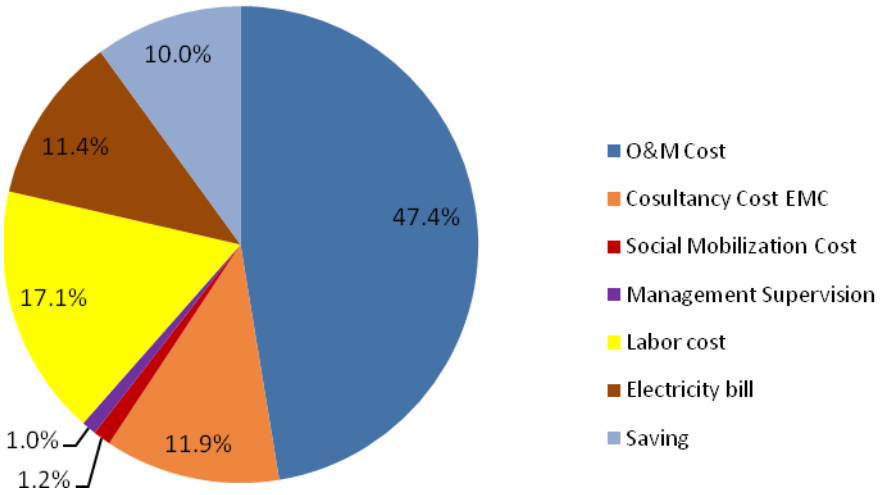
Given the running costs per plant and the number of beneficiaries it can serve, the tariff that can be charged per person is approximately Rs 0.41/liter, hence a monthly bill of no more than Rs. 249 per household.

Use of Revenue and its Bifurcation

The user charges collected from the community will be kept in a bank to be opened by PSPC in the locality. The cash thus collected will be used for costs listed in Table 2. Saaf Pani Committees shall be responsible for maintaining records of expenditures per month. The committees may be authorized to utilize 10% of the revenue for unforeseen expenses incurred e.g. theft of taps or plant damage owing to vandalism. Appropriate technology may be used to monitor the funds collected and used for each filtration plant.

Tentative allocation of monthly revenue generated is shown in the figure below.

Figure 2: Bifurcation of Revenue Collected in a Month from Users of a Single Plant in Priority Tehsils, Bahawalpur



EXAMPLE 2: Tehsil Pattoki, Kasur

This model explores three possible options for providing clean drinking water to village dwellers in Pattoki, Kasur, where there are 188 villages and the population is nearly 939,903. This area is predominantly brackish which is why installation of RO plants may also be considered. The first option is using a combination of regular UF and RO plants with or without packaged plants catering to the average population of a village. The other two options include installation of cluster based mega UF plants that can be provided with or without packaged plants. Summary of these options can be seen in the table below:

Table 3: Options for clean drinking water provision in Patokki, Kasur

Option-1A	Option-1B	Option-2	Option-3
• **150 UF Plants Q= 2000 L/hr** • **150 RO Plants Q= 2000 L/hr**	• **136 UF Plants Q= 2000 L/hr** • **150 RO Plants Q= 2000 L/hr** • **14 Package Pants**	• **Cluster Based Mega UF Plants only – 11 Plants**	• **Tube-Well Based Packaged Plants- 11 Plants**

For options 2 and 3, water for consumers will be available in Sahulat Centres which will be available on a daily basis. Households may then be charged for this water use as per quota per person and number of people in the household.

The following illustrates how total costs can be used to determine water tariff for each option proposed for Pattoki:

Based on 5 liter quota of water use per day and using costs that shall be incurred for proper functioning of each option, a tariff has been proposed that includes 15% markup that can be used for electricity bills, labor cost and repair and maintenance.

Assumptions

1. A household has an average of 6.7 people.
2. Each person uses 5 liters of water per day.
3. About two-third of the population actually use the water provided on a daily basis.
4. One-third of the population may not be able to bear the water tariff, however, they will not be denied of the facility

Table 4: Tariff calculation for each option for water provision in Pattoki, Kasur

	Option 1A	Option 1B	Option 2	Option 3
Total O&M 5 years (Million Rs.)	1809	1771	541	289.5
Social Mobilization Cost (Million Rs.)	5.83	5.83	5.83	5.83
Management Supervision Cost (Million Rs.)	5	5	5	5
Consultancy Cost EMC (Million Rs.)	58.3	58.3	58.3	58.3
Cost of Water Bottles (Million Rs.)	109	109	109	109
TOTAL COST (Million Rs.)	1987	1949	719	468
Total Population	939,903	939,903	939,903	939,903
Population using water (2/3 of total)	626,602	626,602	626,602	626,602
Cost per beneficiary per day per liter @ 5 liters of water use per day (Rs.)	0.35	0.35	0.13	0.08
Cost per household per month (Rs.)	354	347	128	83
Tariff per liter (15% markup) (Rs.)	0.41	0.41	0.15	0.10
Monthly bill per household (Rs.)	417	409	151	98
TOTAL REVENUE (Million Rs.)	2,338	2,293	846	550

Hence, a tariff of Rs. 0.41 for the first option will result in a monthly bill of above Rs. 400 for each household per month. Options 2 and 3 will give revenue of Rs. 150 and almost a hundred respectively with tariffs of 15 paisas for option 2 and 10 paisas for option 3. These tariffs will include 15% markup to cover costs of electricity and repair etc.

It may also be suggested that for option 3, the model of Changa Pani Programme[22] may be adopted where the external piped network be provided for tehsil Pattoki by PSPC in place of Sahulat Centres to provide safe and clean drinking water. The internal component in this case may be built by the community themselves that links the main

[22] As suggested by Mr. Nazir Ahmed Wattoo (founder ASB and member BoD for PSPC)

piped network to respective households. Households not opting for this solution will not have to pay the required tariff while the ones with a connection will pay a designated tariff per liter use monitored by a water meter.

Conclusion

This working paper has recommended adoption of a cost-recovery system for water usage across the Punjab province which should be introduced as PSPC water projects are inaugurated and start delivering drinking water. The paper has argued that if people are certain that they will get reliable and safe drinking water, and an appropriate awareness campaign is carried out, they are willing to bear the operational cost of access to safe drinking water. The paper has also recommended models of water pricing and has outlined their respective assumptions. The paper has argued that water is precious and scarce, and therefore to ensure its conservation and rational use, and to sustain public investment, levy of nominal water usage charges is highly desirable.