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RESEARCH PAPER

Challenges and Solutions in Wash: A Study of Tharparkar Desert in Pakistan

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ABSTRACT

This paper assesses the existing water, sanitation and hygiene issues faced by people in Tharparkar. This desert district faces an acute water shortage problem followed by poor sanitation and inadequate hygiene conditions. Two stage sampling methods are adopted to select villages and households for this study purpose. Physical visits, FGDs and personal interviews were conducted to examine WASH status in targeted areas. The study found that 95% of villages have groundwater as the only major water source which is saline to brackish with high TDS ranging from 3500-7000 ppm. 93% of people practice open defection and 60% don't wash their hands properly after defecation. 65% of schools don't have latrine facilities. Available latrines don't have water facilities. Handwashing facilities in toilets are almost unavailable. Water storage is not practiced adequately. Overall hygiene conditions are not satisfactory. The study recommends consolidated efforts by all stakeholders to improve WASH conditions in Tharparkar.

Introduction

The Thar desert in Sindh province covers four districts while its major part is comprised of district Tharparkar. Water shortage and hot weather are major challenges faced in this region of the desert belt. District Tharparkar lacks many basic facilities including water and food supplies. The unavailability of basic lifesaving facilities affects the overall health of the people of this desert area. While women and children are most vulnerable groups badly affected by poor water supply, insufficient food, lack of effective health facilities and fragile socio-economic conditions (Ali et al., 2018). District Tharparkar in Sindh is mainly comprised of desert, with extended parts to barrage areas and some to hilly parts. The district has an estimated 2 million current human population- with nearly half of minorities- having livelihood dependence on agro-pastoral economy which is based on monsoon rains in desert parts and on irrigation agriculture in barrage parts. The people in Tharparkar are exposed to various challenges due to deteriorated socio-economic conditions (Siyal et al., 2018).

Water is an indispensable need of life. However, when it comes to Tharparkar, the availability of water is not just recognized as a fundamental life need but it also portrays social life, source of joy, sign of property and reason for illness if the water under use is contaminated. Thar region depends on rainfall as fresh water sources. The sufficient rainfall not only provides good quality water but also recharges the underground water table for future consumption. However, shortage of water constantly presents various socio-economic challenges to people in Tharparkar (Chaudhry, 2017). Overall water quality in Tharparkar is not potable. Water testing

confirms hazardous chemical contamination in groundwater of Tharparkar (Khan et al., 2018).

People in Tharparkar have only limited groundwater as a major source of drinking water. However, ground water in Tharparkar is severely contaminated with arsenic and fluoride (Brahman et al., 2013). Tharparkar is a region with a dearth of resources and limited rainfall. The availability of clean water is one among major challenges faced by this desert belt. Unavailability of clean and potable water, poor hygiene conditions, shortage of food has resulted the outbreak of many diseases among children and women leading to thousands of the deaths in the area (Khan and Robinson, 2018).

Tharparkar is regarded as the most water insecure region of the county by both state and non- state actors. The concurrent water shortage, as evident in the last four years, with acute drought, coerced District and Sindh Government to recognize water scarcity issue and undertake indispensable measures to cope with it. Although the approaches adopted by the Government, the installation of RO plants, are not widely encouraged by relevant civil society entities and other stakeholders. However, solar technologies, introduced for ROs, might ensure enduring O&M (operation & maintenance) for these structures. However, this is another chapter that addressing the water issue of Tharparkar may need an integrated approach by all stakeholders with consolidated strategic interventions.

The people in Tharparkar are not resilient to disasters and drought impact. The impact of drought becomes more intense due to overall shortage of water in Tharparkar. Both the water shortage and poverty in this area provokes other health issues including sanitation problems, poor hygiene and malnutrition (Kafle, 2017). The rising temperature and drought in Tharparkar are affecting every sector of human life. To deal with such droughts and water shortage issues it is necessary to adopt water conservation and practices and also to introduce new crops in the area (Shah and Iqbal, 2016).

The objective of this study is to collect ground information amid key WASH indicators including drinking water facilities, harvesting practices, sanitation and hygiene facilities, and available coping mechanism to deal with water shortage and poor WASH services. The study will focus on targeted villages with specific focus on concurrent WASH status and to suggest a way forward.

This study collected data on socioeconomic conditions of the target rural communities with a particular focus on drinking water facilities, basic sanitation and open defecation status, latrine use, hygiene, safe drinking water, waterborne diseases and hand washing practices.

Material and Methods

The efficient sampling for a cluster population is two-stage random sampling. It is easy to implement and effective to be applied for wider population range (Salehi and Smith, 2005). Two stage sampling is effective to select reliable and representative samples from a large and/or complex set of population. It is easy, swift and cost effective (Mahmoudi and Shahraki, 2015).

The study collected information at two stages; at first stage the information at village level was collected through village profiling for all the targeted village, against

key WASH indicators. This was followed by community level interviews and key informant interviews. In the second stage, to collect more authenticate information, 10% of randomly selected households in 10% targeted villages, from all seven zones were sampled, and household level information on key WASH indicators was collected. Village level information was collected through village profiling for all 100% targeted villages, against key WASH indicators.

Random sampling methods are used for collecting data from any remote area in underdeveloped countries. It is effective for surveys where resource constraints hamper complete enumeration (Kondo et al., 2014). The method of random sampling households is an alternative to biassed and expensive data collection (Pearson et al., 2015). However, for household level profiling, 10% random households were selected from 10% targeted villages, for all seven zones, and household level information on key WASH indicators was collected.

Field level data collection was given immense attention to ensure frequency, accuracy, efficacy and quality of data. The key steps adopted for data collection included extensive review of secondary data and existing literature before development of data collection tools. The collected data was compiled and analyzed using SPSS and spreadsheet tools. The analysis was interpreted and narrated for this research paper.

A total of 75 villages were assessed for this study purpose from all ecological zones falling in six talukas of district Tharparkar. To do household level data enumeration and FGDs at village level a total of 28 different union councils were also visited. The number of villages is tabled below.

Table 1
Number of Villages assessed for this study

#	Name of Taluka	Number of Union Councils	Number of Villages
1	Chachro	6	19
2	Daheli	2	3
3	Diplo	3	10
4	Islamkot	6	12
5	Mithi	6	17
6	Nagar Parkar	5	14
	Total	**28**	**75**

Results and Discussions

The study finds that access to safe drinking water is one among most pressing needs for the surveyed communities. More than 95% villagers have only ground water, as major drinking water source, and that is brackish to saline for consumption. 91% of the ground water is not safe to drink as per WHO standards, with high concentration of various salts and minerals – dangerous for human as well as livestock health. In most of the villages it is not even sweet enough to drink. Distance of fetching water varies from hundreds of meters to 3 kilometers. Mostly women are responsible to fetch water. Earthen pots are used for water carrying.

The water storage system is almost unavailable for up to 55% of the households – 45% have ground water tanks used for rainwater harvesting. While it is raining, good quality water is available, however it vanishes as soon as the rain stops. The water drainage system is not in place for (95%) of the households and therefore, wastewater flows from households providing ample opportunity for mosquitoes and flies to freely breed. Sanitation and hygiene conditions in surveyed villages and schools are poor. In some cases, toilets are constructed but still non-functional. Only 07% of households were reported using toilets for defecation, rest of the 93% populace defecate in open. The unavailability of toilets, unaffordability and water shortage, were recorded as major hindrances in this regard.

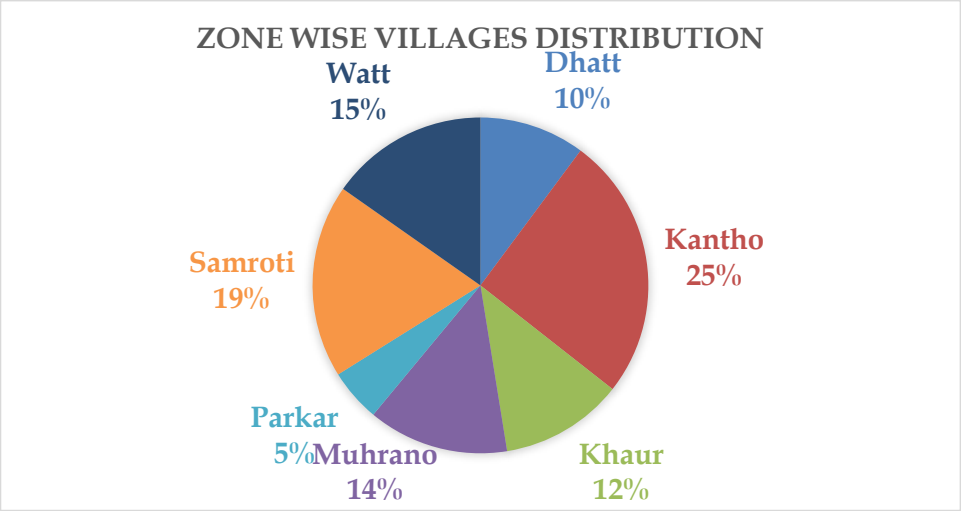

Figure 1: Zone Wise Villages Selected for Assessment

Women are very much dissatisfied available toilets. Most of the schools also do not have functional toilets for children and they also have to go in fields for open defecation. The houses and schools with toilets usually do not have hand washing facilities. Status of hygiene behaviors including proper handwashing, before and after defecation was meagre. Hardly 20% of the surveyed population responded in affirmation for washing hands with water and soap.

At one hand poor access to safe drinking water, improved sanitation & hygiene was recorded in surveyed areas, whereas on the other, research does not find any encouraging awareness campaign including school clubs, village committees etc in targeted communities (village & schools), to improve status of WASH. Teaching session conducted by schoolteachers also lack WASH knowledge and material. Ironically, the study does not find pragmatic policies and practices at the Government's end to address WASH issue of Tharparkar.

Households Profiling

The household level data shows that on an average 07 percent households are headed by women (widow). The average age of household head is recorded at 45 years, having more than 8 members per family. Whereas an average household having 8.5 household size earns monthly PKR 11,300 and spends PKR 11,830. Thus, per capita monthly income is PKR 1329 and expenses PKR 1392. This deficit is adding more liabilities to an average household which already is indebted to multifaceted liabilities.

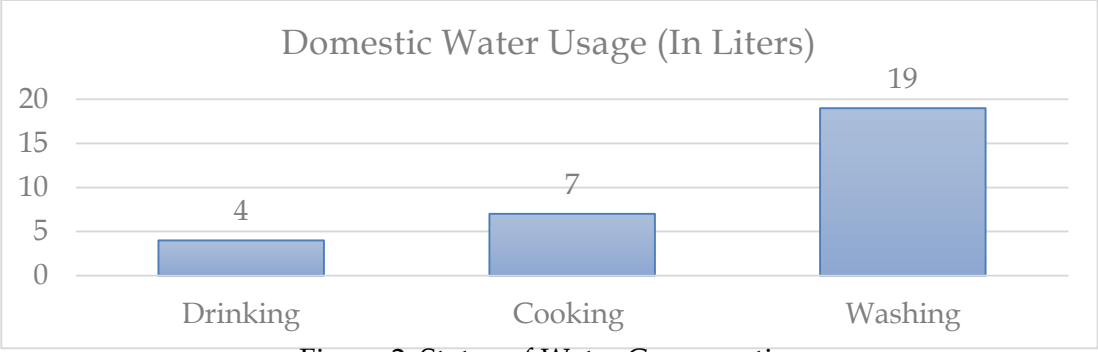

Figure 2: Status of Water Consumption

Ground water is reported as the only drinking water source in targeted villages. All the surveyed households reported that unprotected dug wells are only reliable water sources. 80% of the villagers have to walk daily 01 – 02 kilometers, spending 02-04 hours per day, to fetch drinking water from wells. Research reveals that mostly women and girls are responsible to fetch water.

On average a household consumes around 30 liters of water daily per person, to meet drinking, cooking and washing needs. The drinking, cooking and washing needs were recorded at 4, 7 and 19 liters respectively, which seems much below than minimum recommended 50 liters per capita per day. Hence, this depicts a sheer water scarcity in all forms, ranging from drinking to cooking and washing.

Water scarcity has been reported as a major challenge by all surveyed communities. Current drought conditions and their repercussions have already rendered great loss in Tharparkar. In response to the question of having sufficient water available, most of the households reported that they don't have sufficient water to meet domestic water needs. The reason reported was it is too far to fetch water from dug wells.

Although government of Sindh, under its recent drought response approaches, has installed Reverse Osmosis (RO) Plants in all seven zones of Tharparkar. During village profiling it came under record that around 33 ROs are being installed nearby targeted villages, which will certainly contribute to mitigate water sufferings. However, post Operation & Maintenance of these ROs still remains an unaddressed area.

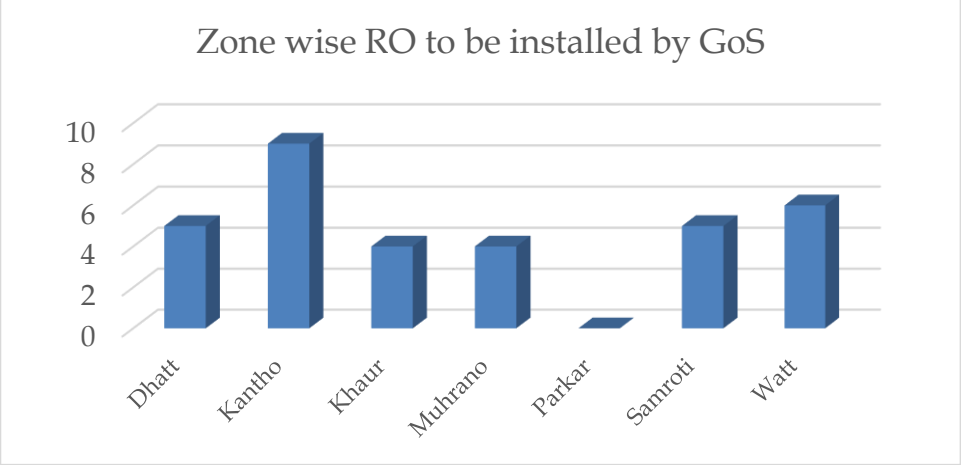

Figure 3: Zone Wise RO Plants Installed

In these conditions people assume that village level water security plans comprising of proper water collection and distribution mechanisms are indispensable coupled with adequate O&M of these gigantic water collection schemes, the ROs.

Quality of Drinking Water

Water characteristics are important indicators to determine its quality. The study reveals that more than 90% of the households have reported either the water is brackish or dirty. This is because most of the dug wells contain brackish water. Even the other water sources are not protected, hence the water available is muddy. Village level profiling intimates that dug wells are only reliable drinking water source, containing ground water chemical contaminations, as per ground water TDS statistics ranging from 3500 – 7000 ppm. Whereas the normal water TDS must be below 1000 ppm as per WHO water testing standards. Village profiling does not find any water treatment mechanism to treat and improve the quality of drinking water. Hence, access to safe drinking water for targeted villagers is the area that needs immediate response.

Water Storage

Data collected from sample households revealed that more than 55% of households have some small size water tanks constructed in their houses. Although their storage capacity does not exceed 5000 liters per tank, however, they service good for water harvesting during monsoon rains. Moreover, these underground tanks do not have sufficient catchment area, thus need various showers to get filled in. Villagers also reported that during the last couple of years, in rare showers, these tanks were not filled properly. Zone-wise total water tanks for targeted villages are tabled below.

Table 2
Number of Underground Water Tanks in Surveyed Zones

#	Name of Zone	Number of Tankas
1	Dhatt	1852
2	Kantho	1209
3	Khaur	716
4	Muhrano	967
5	Parkar	161
6	Samroti	814
7	Watt	160
Total		**5,879**

Around 80% of households used earthen ware and 20% of the household also reported using plastic bucket and other metallic container. Mostly, pieces of cloth are used to filter drinking water, as reported by the majority of surveyed villages. This research also probed local understanding for how to address water scarcity issue in Tharparkar. 49% assume rainwater harvesting structures, 04% encourage additional dug wells, 25% suggest ROs, 19% encourage pipe water supply and 2% believe construction of dams are the solution to water problems of Tharparkar.

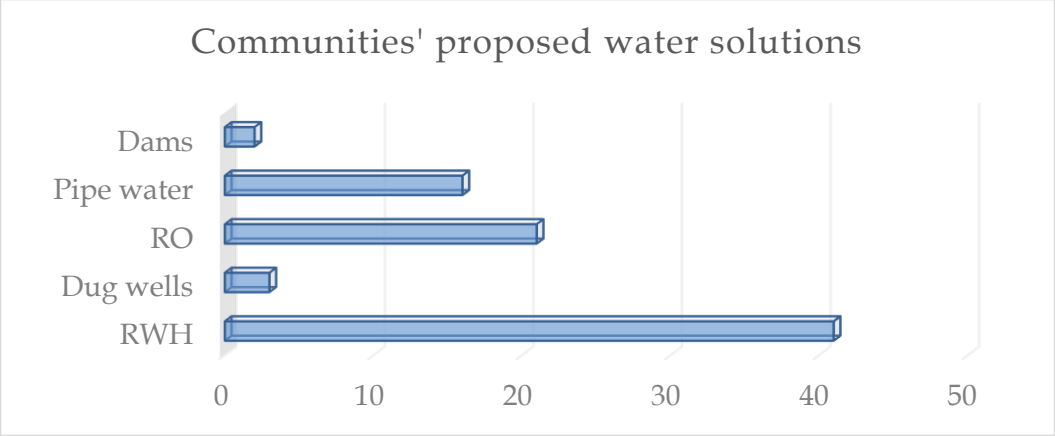

Figure 4: Communities Proposed Water Solutions

Sanitation Conditions

The Baseline study highlighted open defecation, the major sanitation problem, in targeted villages. Although some of the toilet structures are reported in targeted villages, however, either these toilets are non-functional or using them is not customary to rural populace in surveyed villages. The collected figures conclude that on average 22% households have some sort of toilets structures, however, more than 85% people in targeted communities, practice open defecation.

Table 3
Number of Toilets in Surveyed Zones

#	Name of Taluka	Total Households	Number of Toilets	%age
1	Dhatt	1902	225	12%
2	Kantho	4000	958	24%
3	Khaur	1722	477	28%
4	Muhrano	1321	453	34%
5	Parkar	841	86	10%
6	Samroti	2585	885	34%
7	Watt	2994	284	9%
Total		**15365**	**3368**	**22%**

40% of people consider open defecation an unhealthy practice while 60% consider is major source of triggering diseases and polluting the environment.

Waste Disposal

The study intimates that around nine in ten households (87.6 percent) throw their domestic waste in the open fields and eight percent households burned the domestic waste which also leads to environmental hazards. In the surveyed villages none of the households have drains for water waste, thus, drain it out in open space or streets. The probing triggered further discussion with households, and it came to the realization that more than 90% of the households had never taken any measure against mosquitoes.

Sanitation Practices in Schools

Data indicates that only four in ten households send their children to schools when asked "do your children use school's latrine" from those who send their children to the school, more than 85 percent replied to no. The reason behind was found that there was no toilet facility available in the schools. Besides, only 10% of the respondents reported the availability of handwashing facility in the school toilets. More than 95 percent were using only water for hand-washing purposes followed by only five percent using water with soap.

Hygiene Conditions

Hygiene status at household and village level was assessed in targeted communities. It was alarming that around 60% of people wash their hands with only water after defecation. Whereas 20% wash with water and mud and rest of the 20% use water and soap for hand washing, after defecation.

The study also used community level data collection through FGDs, to assess the availability and status of water availability and WASH-related facilities at the village-level and school level. Overall, it is found that 65% community schools' do not have latrine facility and 15% communities complained that schools' latrines are dirty. 15% of communities reported that school latrines have no water facility.

Only 5% of sampled communities have any type of hand washing facility in schools. All of those use water for handwashing, while only less than 1% communities reported that cleaning agents like, ash/mud is being used for hand washing in schools. A meager number of communities mentioned that nothing is used for hand washing.

(12%) sampled communities get benefit of water and sanitation facilities from NGOs and Government (3%) while more of the half communities reported that there is no such type of organization working for them.

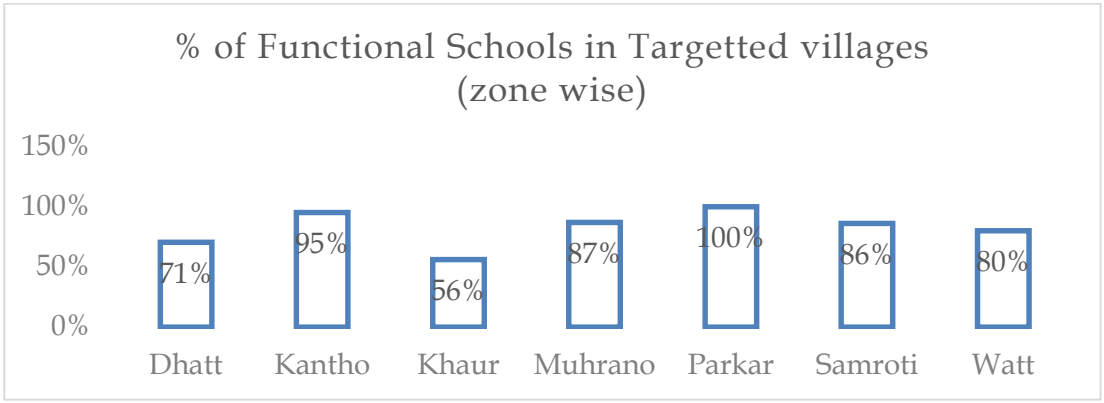

Figure 5 Zone Wise Functional Schools

This survey also found that some of the schools are non-functional. Although school buildings were available. However, the unavailability of teachers and poor motivation of parents resulted in schools being closed in some villages. Zone-wise number of schools and their functionality status is tabled below.

Table 4
Number of Functional Schools in Surveyed Zones

#	Name of Taluka	Number of Schools	Functional Schools

1	Dhatt	17	12
2	Kantho	41	39
3	Khaur	16	9
4	Muhrano	23	20
5	Parkar	5	5
6	Samroti	36	31
7	Watt	15	12
Total		**153**	**128**

The study highlighted the poor hygiene conditions in schools as well. The role of school management committees seems dormant. None of the surveyed schools had WASH groups, children peer to undertake WASH activities in schools. The hygiene conditions were poor in most of the visited schools.

Findings do not find any good attention paid to personal and environmental hygiene in teachings sessions. Teachers seem either unaware or reluctant to include WASH knowledge and material in these lectures, being undertakes with school children.

Traditional Water Harvesting Practices:

Study found that Tharparkar, being a water scare region, has various water harvesting practices in place. Local communities construct underground water tanks within their households to collect and harvest rainwater. In some cases, people shared their experience of harvesting rainwater through roof, where packa or semi packa room structures are available. Village level profiling also suggests that there arearound 53 village level kacha ponds "Tarais" near target villages. Additionally, 33 packa ponds are also being constructed in the jurisdiction of targeted villages.

Table 5
Number of Packa and Kacha Ponds in Surveyed Zones

#	Name of Taluka	Number of Kacha Ponds	Number of Kacha Ponds	Total
1	Dhatt	6	5	11
2	Kantho	15	7	22
3	Khaur	7	4	11
4	Muhrano	7	7	14
5	Parkar	3	3	6
6	Samroti	6	4	10
7	Watt	9	3	12
Total		**53**	**33**	**86**

These ponds collect and harvest rainwater through their natural catchment area and serve as a major drinking water source of human and livestock consumption for 2 – 3 months after rainy seasons. However, due to unprotected structures, they come under direct contact of human and livestock feces, thus becoming contaminated. Discussion with communities concludes that if some renovation and innovations are introduced to these structures, to increase its harvesting capacity and effective water distribution mechanism at village level, then they could serve as major drinking water source for 5 – 8 months during dry seasons.

WASH Policies, Procedures and Advocacy

This study also collected secondary information on existing WASH policies at District Government level and found pathetic WASH policies and procedures. It is evident that the District Annual Development Plan's budget does not allocate enough portion of budget to address WASH issue of Tharparkar. Although recent grants from Sindh Government, for ROs installation has been trickled down in Tharparkar, however, District Government should still have to ensure adequate O&M of these mega structures. Besides, secondary information does not endorse an encourage status of school WASH.

Moreover, the information material and appropriate knowledge of subject matter is another area the project needs to address. The research does not find any suitable knowledge material on WASH to be utilized to sensitized District Government to shape its WASH related policies, to encourage other stakeholders of collect efforts and to mobilize local communities to adopt sustainable WASH solutions.

Although various stakeholders, including Government Departments, International Donors, Local NGOs and philanthropists are working to address water issue and WASH in general, however, sheer gap is noticed of effective coordination. This study recommends a platform, to be established at district level, with participation of all stakeholders to address WASH issues of Tharparkar.

Conclusion

The findings are concluded as the access to safe drinking water is one among most pressing needs for the surveyed communities. More than 95% of villagers have only ground water, as major drinking water source, and that is brackish to saline for consumption. Village level profiling intimates that dug wells are only reliable drinking water source, containing ground water chemical contaminations, as per ground water TDS statistics ranging from 3500 – 7000 ppm. Whereas the normal water TDS must be below 1000 ppm as per WHO water testing standards. Village profiling does not find any water treatment mechanism to treat and improve the quality of drinking water. Hence, access to safe drinking water of targeted villagers is the area needs immediate response. Distance of fetching water varies from hundreds of meters to 3 kilometers. Mostly women are responsible to fetch water. Earthen pots are used for water carrying.

The water storage system is almost unavailable for up to 55% of the households – 45% have ground water tanks used for rainwater harvesting. While it is raining good quality water is available, however it vanishes as soon as the rain is off. On average a household consumes around 30 liters of water daily per person, to meet drinking, cooking and washing needs. The drinking, cooking and washing needs were recorded at 4, 7 and 19 liters respectively. Data collected from sample households revealed that more than 55% of households have some small size water tanks constructed in their houses. Although their storage capacity does not exceed 5000 liters per tank, however, they service good for water harvesting during monsoon rains.

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the schools also do not have a functional toilet for children and they also have to go for open defecation.

It was alarming that around 60% of people wash their hands with only water after defecation. While 20% wash with water and mud and the rest of the 20% use water and soap for hand washing, after defecation. Overall, it is found that 65% community schools' do not have latrine facility and 15% communities complained that schools' latrines are dirty. 15% of communities reported that school latrines have no water facility. Only 5% of sampled communities have any type of hand washing facility in schools. All of those use water for handwashing, while only less than 1% of communities reported that cleaning agents like ash/mud is being used for hand washing in schools. A meager number of communities mentioned that nothing is used for hand washing.

No awareness campaigns, in relation to water in particular and WASH in general, were found in targeted villages. Although the government is going to install around 33 ROs near target villages, villagers don't have efficient water distribution and management mechanisms in place. Operation and Maintenance of these ROs is yet another challenge for local communities. Awareness campaign including school WASH clubs, village committees etc in targeted communities (village & schools) were not reported during survey.

Teaching sessions conducted by schoolteachers also dearth of proper WASH knowledge and material. The study does not find pragmatic policies and practices at the government's end to address the WASH issue of Tharparkar. Water scarcity has been reported as major among all surveyed communities. Current drought conditions and their repercussions have already rendered greater loss in Tharparkar. In response to the question of having sufficient water available, most of the households

Recommendations

The study recommends developing water security plans at village level and district level besides, introduction of various water focused interventions. The programmes are required to promote WASH to implement innovative interventions in target villages and later advocate for their replication at district level.

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