Assessing the Affordability of Water, Sanitation and Hygiene: Pakistan Country Case Study


Executive Summary

Improving Access

Affordability is an essential part of improving access to water, sanitation and hygiene (WaSH) products and services. The cost of access, whether that is a monthly bill or an investment in household infrastructure, is sometimes the largest barrier to improved access. Household budgets may only allow for access to water sources that are far from the home; or that carry some risk of being contaminated; or that are at risk of late deliveries or insufficient quantities of water; or that are at risk of drying up entirely, either seasonally or due to climate shifts. Intra-household budget allocations may not allow for safe, clean and dignified public latrines; limited access to credit or ability to save may hinder private latrine construction; it may also prevent proper treatment of wastes before disposal into the environment. Making prices and costs affordable is not always a sufficient condition, but is a necessary condition for improving access.

Yet, very little has been done to track affordability at the global scale; no single indicator, nor set of indicators has been adopted in order to elucidate the relationship between policies, interventions and household costs within the WaSH sector. While it is easy to see that affordability is an essential part of any effort meant to improve WaSH access, tracking affordability is complicated and presents a unique set of challenges. With that in mind, we present a comprehensive assessment of an exhaustive list of affordability indicators, in the hopes that our efforts may eventually lead to improved tracking, more focused efforts and increased transparency of this essential component of WaSH.

In order to assess our affordability indicators, we have applied them to six different countries, including Ghana, Mexico, Uganda, Pakistan, Cambodia and Zambia. This executive summary focuses on the case of Pakistan. Using data from Pakistan’s HIES/HIICS (2015-16), we have data on access to WaSH services, some data on O&M expenditures for WaSH, total household expenditures, and time spent collecting water.

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1 See full report for list of expert group (“The Measurement and Monitoring of Water Supply, Sanitation and Hygiene (WASH) Affordability”). The authors of this country report were: Zachary Burt (UNICEF Consultant) conducted data analysis and drafted this report; Akmal Abdurazakov (UNICEF Consultant) conducted data extraction and data analysis; Guy Hutton (Senior Adviser for WASH, UNICEF New York) lead the study and contributed to data analysis and report drafting.
In 2015/2016, coverage of basic water was very similar in rural and urban areas; 86% in the former and 89% in the latter. Basic sanitation access was much lower though; only 64% nationally. Likewise, roughly 90% of the country spent 15 minutes or less collecting their water, each trip. The average time spent per day accessing water from different sources varied considerably; surface water and other unimproved sources had a larger time expenditure than piped sources or other types of basic access. Surprisingly, richer households, on average, spent more time waiting and collecting their water than did poorer households; 20% of the households from the richest decile of total expenditure spent more than 15 minutes waiting and collecting their water, while the same was true for only 6% of the households in the poorest decile.

**Defining Affordability**

When it comes to accessing WaSH services, affordability has three dimensions: (i) the price or cost of WaSH services; (ii) the spending power of the household; and (iii) the price or cost of other household needs. The interplay between these three dimensions is depicted in Table 1. For example, the most vulnerable household where WaSH services are least affordable is one which is poor, and/or faces high WaSH prices and/or does not have state support for other social services. Naturally there will be ranges in income, price levels and spending required on other essential services which gives rise to a 3-dimensional space where cut-offs will be needed if there is a desire to categorise households.

| Table 1. Degree of vulnerability resulting from three dimensions of WaSH affordability |
|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| Welfare state or other source covers health, education, housing, pension, etc | Welfare state or other source does not cover health, education, housing, pension, etc |
| WaSH prices low | WaSH prices high | WaSH prices low | WaSH prices high |
| Low income | Not Vulnerable | Vulnerable | Vulnerable | Most vulnerable |
| Median income | Not Vulnerable | Not Vulnerable | Not Vulnerable | Vulnerable |

Policies and programs can be designed to address one or more of these dimensions. Policies not aimed at these three dimensions may nonetheless have a deleterious, or beneficial, impact on them all the same. For example, if an urban piped-water network is newly expanded into a peri-urban area that had previously only used private wells, the average cost of water service may go down. Likewise, if an urban center that already has intermittent piped water services is upgraded to continuous piped water services, the average cost of water may go up.

In order to better track the results of intentional efforts, and any unintended consequences, we propose the use of affordability indicators. Such an indicator can be used to compare progress on WaSH affordability over time or between different countries, regions, cities and socio-economic strata. Indicators are useful to assess the impact of interventions focused on affordability; they can also be used to put pressure on service providers to make access to WaSH more affordable.

An indicator of affordability must also include a definition of what we mean by ‘access’. In the case of WaSH, any indicator of affordability should explicitly define the minimum level or type of access.
considered acceptable. The question is not just if households have the ability to pay for the access they have, but whether or not that access meets the requirements of the human right to water, or the Sustainable Development Goals (SDGs), or some other national policy goal. An affordability indicator which does not define minimum acceptable service levels will find lower levels of access to be more affordable; designing an affordability indicator which promotes risky, unreliable water sources, or undignified, unhealthy places for defecation, is not acceptable. For example, when expanding access to boreholes in drought-prone areas, it may be cheaper to drill shallow wells that dry up as the climate shifts; or in urban areas, it may be cheaper to provide free trucked water, or standpipes, to slum areas, and only build pipes in middle and high income neighborhoods. Likewise, unlined pit latrines are cheaper than septic tanks or lined pits, but in places with a high water table they may contaminate local wells; and community toilets may be cheaper when they don’t have proper lighting or an attendant at night, but in so doing they also become more dangerous, especially for women.

Affordability is a major determinant of whether WaSH access improves, or declines, over time. It is an important first step towards breaking down the determinants of access. Reliability and resilience are also important factors determining WaSH access over time. As mentioned above, the minimum acceptable access level must be defined in any affordability indicator in order to ensure that such indicators do not encourage a back-sliding in access. In the same way, as the climate shifts, it may become necessary to define minimum levels of resilience and reliability. For example, if the water utility operator in Karachi reduces volumetric tariffs for piped water access, and the loss in revenues leads directly to insufficient funds for operations or maintenance, then this could lead to decreased reliability and resilience of piped water services. In this scenario, an increase in affordability will have been due to a decrease in reliability and resilience, thus an undesirable outcome.

Design Categories for Affordability Indicators

There are many affordability indicator options which to a lesser or greater extent capture the cost of access to WaSH, the spending power of households, the cost of other basic needs and the quality of access. We have grouped indicators based on method of calculation, creating four main categories as applied to the household level.

1. **Reported and estimated expenditures**: These indicators use reported expenditure on WaSH access, collected through household survey, or estimated expenditures based on the average cost of a defined minimum level of access, then divided by some estimate of household spending power.

2. **Revealed household preferences**: Observed preferences expressed through household willingness to pay (WTP) or aggregated demand for WaSH products and services. The relationship between price and demand is modeled, a minimum level of access is specified, and ‘affordable access’ is defined by the cost at which households demand at least that minimum level.

3. **Stated household preferences**: Reported preferences for WaSH access, exclusively WTP studies, modeling the relationship between prices and consumption. They typically involve an interview with the household member(s) responsible for WaSH access and budget decisions, posing a range of questions to elicit WTP estimates. A minimum level of access is specified, and ‘affordable access’ is defined by the cost at which households demand at least that minimum level.

4. **Comprehensive household poverty assessment**: Broad assessments of household poverty examine household wealth in the context of the range of basic needs they are expected to satisfy, and they include a number of approaches that examine the poverty line in relation to WaSH and the interplay between expenditures on different basic needs.

In this executive summary we will explore mainly design category 1, for which data are available for Pakistan: reported and estimated expenditures.
Note that household affordability cannot be looked at in isolation from overall affordability to society, given that subsidized services to make WaSH services more affordable to households needs to be paid from somewhere – e.g. cross-subsidies from businesses, cross-subsidies from other categories of household, or from the government – but that these subsidies might not be sustainable over time. If this is the case, cost shifting over time to the (poor) household might lead to WaSH services becoming less affordable. Second, WaSH service pricing might not currently take into account environmental considerations, such as pollution via fecal matter or wastewater not being treated, or extraction of water at unsustainable levels, which in the longer term will lead to higher priced services. Therefore, these issues need to be considered in the interpretation of the assessment of household-level affordability.

Assessment of Affordability Indicators

There is unlikely to be any single indicator which entirely captures the full essence of the affordability of WaSH services for all countries and for all settings within a country. Hence, it will be necessary to have a flexible approach to measuring affordability, based on the context and the data available. Our assessment includes three principals:

1. **Feasibility**: the ease of estimating an indicator, given data availability
2. **Validity**: the degree to which the definition of an indicator has encompassed each of the dimensions of affordability.
3. **Accuracy**: The degree to which we might expect that an indicator has captured the definition intended.

Our goal is not to select a single indicator that best meets these three principals for global usage, but to present a thorough assessment of the available indicators in six countries, and conclude with a detailed listing of the issues that should be taken into consideration. Ultimately, it may end with a subset of indicators for ready consideration for national and/or global monitoring.

**Design Category 1: Reported and Estimated Expenditures**

Household costs of WaSH expressed as a proportion of spending power is a category of affordability indicators that compares what they are spending, or might spend, on WaSH in relation to their total income or expenditure. Part of the design of each indicator is the definition of thresholds and cut-offs for different aspects of access which we have deemed might be relevant. This indicator category covers only the first two dimensions of affordability: WaSH prices and household income; it does not include the third dimension, which looks at the cost of meeting other basic needs.

We have identified three kinds of expenditure data that one might use for these types of indicators: option 1 is to use full, actual WaSH expenditures; option 2 is to use partial, actual WaSH expenditures; and option 3 is to use full, estimated WaSH expenditures (see Table 2). Actual WaSH expenditures are reported, and due to the limited questions in expenditure surveys they often cover only partial O&M expenses; and they represent the current level of access experienced by households (which either may not meet the minimum requirements of policy goals or they may exceed those minimum requirements). Estimated WaSH expenditures can be set at minimum acceptable levels of access, and used to modify reported data: for our indicator design, households with less than a basic level of access had reported cost data replaced by our estimated cost of minimum access. Given the unavailability of full cost data sets, Option 1 indicators were not feasible at this time. For Option 2 and Option 3, we defined 2.1 and 3.1 as only including O&M costs; 2.2 and 3.2 as including O&M and time costs; 2.3 and 3.3 as including total capital costs; 2.4 and 3.4 as including annualized capital costs and O&M costs; and 2.5 and 3.5 as including annualized capital costs,

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2 ‘Basic access’ here is defined as meeting the JMP definition for basic access for water, sanitation and hygiene.
O&M costs and time costs. Given the availability of data, 2.2, 2.3, 2.4, 2.5 and 3.2 were not feasible at this time. The remaining indicators have been used in the examples, below.

Table 2. Summary of expenditure or cost items included in each indicator

<table>
<thead>
<tr>
<th>Indicator Options</th>
<th>Actual Expenditure on WASH</th>
<th>Required Expenditure on WASH</th>
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<tbody>
<tr>
<td></td>
<td>All O&amp;M</td>
<td>Partial O&amp;M</td>
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<tr>
<td>Option 1: full actual expenditure</td>
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<tr>
<td>Option 1.1</td>
<td>✔</td>
<td></td>
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<td>Option 1.2</td>
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<td>Option 1.3</td>
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<td>Option 1.4</td>
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<tr>
<td>Option 1.5</td>
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<td>✔</td>
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<tr>
<td>Option 2: partial actual expenditure</td>
<td></td>
<td></td>
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<tr>
<td>Option 2.1</td>
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<td>Option 2.2</td>
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<td>Option 2.3</td>
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<td>Option 2.4</td>
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<td>Option 2.5</td>
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<td>✔</td>
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<td>Option 3: full required expenditure</td>
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<tr>
<td>Option 3.1</td>
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<td>Option 3.2</td>
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<td>Option 3.3</td>
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<td>Option 3.4</td>
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<td>Option 3.5</td>
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</tbody>
</table>

These different types of WaSH cost data were then divided by a measure of household spending power. For these we found five possibilities: total annual income (A); disposable annual income (after taxes) (B); total annual expenditure (C); annual expenditure on discretionary items (D); and minimum wage rate (E). The third of these (C) is considered a more reliable estimate of household cash resources than reported income, so this was what we used in our example indicators. Using these affordability indicator definitions, we can then apply these indicators across different data stratifications.

In Figure 2, affordability indicator 2.1C is shown across deciles of total household expenditures, in both rural and urban areas of Pakistan. The proportion of total household expenditures allocated to water is slightly higher in rural areas for most household expenditure levels, but the overall pattern in rural and urban areas is very similar. While the percentage of household expenditure does not show a correlation with households expenditure level, nearly all deciles spent more than 6% of their expenditures on O&M costs.
The average O&M costs (including water bills) were much lower for households that had access to better water sources; basic water access (including piped, bottled or other improved sources) cost less than a third as much as other sources (including unimproved sources and surface water sources). This is concerning as these other sources not only had great monetary costs, they had great time expenditure requirements as well (which are not included in 2.1C but are in 2.2C).

Time expenditure across these same types of water access shows a similar pattern to the partial WaSH costs; unimproved sources require greater time expenditure, as well as greater monetary expenditure. Although only 2% of the population uses surface water sources, 44% of those who do have to spend more than 15 minutes collecting their water, each time that they fetch it. Similarly, even though only 7.4% of the population uses other types of unimproved access (such as unprotected springs and dug wells), roughly 33% of them spend more than 15 minutes collecting water, each time that they fetch it (see Figure 4). Surprisingly, time expenditure was positively correlated with total expenditure level; 20% of households in the highest decile of total expenditure spent more than 15 minutes collecting water, while the same was true for only 6% of the lowest decile.
In Figure 5, we have tracked the frequency of occurrence for different levels of affordability indicators 2.1C and 3.1C. Without choosing a cut-off for the minimum percentage of total expenditure that might be considered affordable, this analysis shows the distribution of different percentage-levels. Looking at the distribution of affordability indicator 2.1C, we see that the majority of households spend no money on water O&M costs, indicating a high degree of affordability. But according to our estimates of the required O&M costs for basic WaSH access, which include not just water but also sanitation and hygiene, then the affordability shifts quite a bit. Current expenditure is, on average, much lower than the expenses required for basic access (affordability indicator 3.1C).

All of the affordability indicators presented so far do not incorporate capital costs. Upfront expenditure data was only available for the estimated cost of basic access; this is a national average and does not incorporate variations in cost that might occur across different locals, due to the particulars of local markets. In Figure 6 we show upfront costs as a percentage of annual expenditures, across total expenditure deciles; we see that upfront costs are potentially a major barrier to access, especially for poorer households.

As shown in Figure 6, the upfront costs have a significant impact on affordability. In order to calculate Indicator 3.4, the upfront costs were amortized over the expected life of the capital goods (i.e. bathrooms, wells, etc), using a discount rate of 5%. These were then added to the estimated cost of O&M used to calculate Indicator 3.1. Using these estimates we then calculated the total annualized costs as a percentage of total expenditure across deciles of household expenditure. According to our estimates, only the richest 30% of households would have an annualized total cost less than 100% of their household expenditure budget.

Source: UNPS 2015/2016
Looking at all possible affordability indicators that use a ratio of costs to spending power, we have tried to assess the feasibility, accuracy and validity of each. Despite being perhaps the most valid affordability indicator, data limitations make indicators which use full actual expenditures on WaSH access (Option 1) infeasible. Affordability indicators which use partial actual expenditures, by definition, do not include all costs and are therefore less valid and less accurate. But in the case of Pakistan we do have data on partial actual expenditures, which make feasible affordability indicators under Option 2 and Option 3.

Setting a minimum level of access for an indicator is a way of ensuring that affordability goals are not achieved at the cost of improved access to WaSH. We incorporated this in affordability indicators 3.1 - 3.5 by estimating the required costs for basic access, and replacing the actual costs for any household that did not have at least basic access. While we would argue that this increases the validity of the indicators, it is possible that it also decreases its accuracy.

In Figure 7, we can see that required costs for basic access O&M were, on average, less than the reported actual costs of O&M. This was a surprising result, as it would imply that (i) a large number of rich households are not using basic WASH access and (ii) these richer households are paying more for unimproved WASH services than the cost estimates we gathered for basic WASH access in Pakistan. For
both of these assumptions to hold, seems unlikely, calling into question the validity of these results, and perhaps the validity of the original dataset.

**Enabling environment**

The enabling environment is a broad, catch-all phrase that can include legal instruments, citizen voice, policies and programmatic measures. Such measures protect the poor from the cost of WASH services either directly or indirectly, either by lowering the costs of WASH (or other) services for households, or by increasing household income to pay for WASH services or other essential services. These measures cover the first two dimensions of affordability, if the measures are WASH-specific. However, if the measures are not WASH-specific (e.g. a general household income support or change in prices of healthcare, education, food or rent), then it covers the third dimension. The analysis here contains information from the UN-Water Global Analysis and Assessment of Sanitation and Drinking-Water (GLAAS), administered by WHO.

In Pakistan, there is a legal recognition of the human right to water and sanitation in the constitution. On the other hand, WASH is well reflected in Pakistan’s development priorities. A national water and sanitation policy has been approved and national implementation plans have been developed although they have not yet been adopted and implemented as of yet. The national target for sanitation is 62% coverage of safely managed sanitation by 2030, in both urban and rural areas. For the water targets, urban and rural areas should have 97% coverage of safely managed water access by 2030. There is a joint sector review of progress towards these targets, including at provincial level, but there is infrequent monitoring for drinking water and no regular surveillance for sanitation. Furthermore, there is no regulatory authority responsible for the quality of service delivery, or for the setting of tariffs, for neither water nor sanitation, whether in rural or urban areas.

Financing plans for meeting the targets have been enacted and consistently followed for sanitation and drinking water in urban and rural areas, and for WASH in schools, but not for hygiene promotion, nor WASH in healthcare facilities. Roughly a quarter of total national WASH expenditure is borne by households, with the vast majority of the remaining expenditure coming from government spending. Despite the heavy government expenditure, Pakistan has no official affordability schemes, implying that it is not known whether these funds have made WASH access more affordable or not, and there is no publicly available monitoring of the distribution and nature of subsidies across income levels and social groups.

For the time being, Pakistan only tracks the equitability of access, rather than the distribution of costs and subsidies. National performance indicators on equitable service coverage for both water and sanitation have been adopted and implemented. It also has in place measures to bring access to poor populations, but these remain only partially implemented. At the same time, community participation procedures are officially defined by the government with women’s participation included for drinking water and sanitation in both rural and urban areas, which should give opportunity for WASH users a certain degree to provide input and feedback, at least at the local level.

**Conclusion**

We find it important that an assessment is done when choosing which affordability indicator makes the most sense, and we argue that validity, feasibility and accuracy as we have defined them, are key criteria to be considered. In terms of judging what is affordable versus what is not affordable, the most valid indicator is one that includes all three dimensions of affordability; preference modeling meets this criteria, but unfortunately such models were not available for Pakistan. WaSH expenditure data and total household expenditure data are available, and affordability indicators based on a ratio of the former over
the latter incorporates at least the first two dimensions of affordability. Overall, the Pakistani population spent, on average 8.8% of their total expenditure to pay for O&M water expenses, including water bills.

In concluding, we seek to make some judgement drawing on General Comment 15: “...payment for water services has to be based on the principle of equity... Equity demands that poorer households should not be disproportionately burdened with water expenses”\(^3\). Using Indicator 2.1C, it appears that poor households are spending roughly the same proportion of their expenditures on WaSH as non-poor households (see Figure 2). But in addition, households with lower levels of access are spending more time fetching water than households with access to basic water services, adding to the cost of access for the most marginalized households. When adding in amortized estimates for the upfront costs for at least basic access, and the total annual costs for access goes above 6% of total expenditures for over half of the population, and above 10% for the poorest decile of total expenditure.

**Recommendations - Data**

Data were available for Pakistan for time expenditures associated with water collection, but no data were collected regarding the number of trips per day made to collect water. Adding a question to future data collection efforts regarding the number of trips per day would increase the accuracy of time expenditure estimates and allow the estimation of Indicators 2.2C and 3.2C. In order to estimate Indicators 2.3C-2.5C, adding data collection on capital expenditure would allow more accurate affordability assessments regarding the full range of WaSH cost categories. A list of data needed for the estimation of Indicators 2.1C-2.5C and 3.1C-3.5C is presented in Table 3.

In this report we used four sets of categories through which we analyzed Indicators 2.1C-2.5C and 3.1C-3.5C: these were residence in rural or urban areas, deciles of total household expenditure, types of access and levels of access. The first two categories allowed us to explore affordability through the lens of equity; the second two categories allowed us to explore potential tradeoffs between quality of access (in terms of access and water quality/safety) and affordability. Potential future affordability indicators may need to track a more comprehensive accounting of costs, and how these costs are distributed over different income levels and social groups.

Additional data have the potential to allow the interrogation of the tradeoffs between affordability and reliability, resilience or intra-household equity. As mentioned earlier,

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ratios of expenditures over a measure of spending power is only one category, out of four categories identified, of affordability indicators. Other types of data are necessary in order to explore the other categories. For example, a static assessment of demand, one of the affordability indicators in the category of revealed demand, requires data on the sufficiency of water quantity. In addition, comprehensive poverty assessments, the fourth category of affordability require information such as poor/non-poor status, or regular payments of water charges. We recommend that such analyses be explored in the future, and if possible, some of the questions listed in Table 3, or other similar types of information, be integrated into future data collection efforts.

Recommendations - Policy

Increases in production efficiency might decrease costs, and should be pursued when possible, but in many cases the cost of access will need to be subsidized in order to make access more affordable. Indeed, WaSH access is currently subsidized in many locations around the globe. But it is important that subsidies are designed in such a way that they encourage improvement and expansion of access over time and have a net positive impact over all locations and social groups. Furthermore, it has been observed that subsidies do sometimes go to more privileged or better resourced households, while marginalized and poorer households are over-looked. Affordability is likely a major barrier for the extension of basic WaSH access to all Pakistani households, and we would argue that adopting an indicator of affordability should be a priority for policy makers in the WaSH sector in order to make sure that subsidies are distributed in such a way that those who can least afford basic access are prioritized.