Measuring the Impact of West Bengal Drinking Water Sector Improvement Project
A Baseline Study

Access to safe drinking water is a fundamental right of people. The West Bengal Drinking Water Sector Improvement Project is assisting the Government of West Bengal to provide safe, sustainable, and inclusive drinking water services to over one million people in the arsenic, fluoride, and salinity-affected areas of Bankura, North and South Parganas, and Purba Medinipur districts. This publication sets the baseline of the project by providing the benchmark comparison of primary outcomes for the project and non-project households, before implementation, so that an impact evaluation can be carried out at project completion.

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Measuring the Impact of West Bengal Drinking Water Sector Improvement Project: A Baseline Study

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| Abbreviation | Description                                      |
|--------------|--------------------------------------------------|
| ADB          | Asian Development Bank                           |
| LPG          | liquefied petroleum gas                           |
| mg/l         | milligrams per liter                              |
| NFHS         | National Family Health Survey                     |
| PHED         | Public Health Engineering Department              |
| WBDWSIP      | West Bengal Drinking Water Sector Improvement Project |
EXECUTIVE SUMMARY

A baseline evaluation survey was designed, planned, and executed taking into account the intended impact, outcomes, and outputs of the West Bengal Drinking Water Sector Improvement Project (WBDWSIP), which is expected to be completed by 2024. The project areas have been selected based on a combination of two factors: (i) prevalence of water source-related health issues and (ii) lack of piped water supply.

The baseline survey covers 2,013 households from randomly selected 28 project gram panchayats and 29 non-project gram panchayats (village-level local administrative unit) in the four project districts: Bankura, Purba Medinipur, and North (and South) 24 Parganas. It provides pre-intervention information on both project and non-project households. A sampling proportional to size of the project districts was used with size determined by the number of households in project areas. The sample size was determined by power calculation using data on primary outcomes from the National Family Health Survey (NFHS-4) 2015–2016. The household survey data was gathered using a structured questionnaire administered in face-to-face interviews with selected respondents and was supplemented by a set of qualitative data.

The purpose of the baseline survey is to provide the benchmark comparison of primary outcomes for the treatment and comparison households before the project was introduced. It is ideally required that treatment and comparison areas be balanced so that whatever difference in primary outcomes found in the endline evaluation can be attributed to the project.

The survey finds that the three major sources of drinking water for the sample households include tube well or bore well (42%), public hand pump (34%), and private hand pump (13%). Lower proportion of households in project areas use public handpumps compared to non-project areas (28% vs. 41%) and a higher proportion of households in project areas are using tube well/bore well (46% vs. 40%) and bottled water (6% vs. 2%). Public water supply is available from 40 to 44 hours per week and is lower in project areas compared to non-project areas.

Households without water sources within premises, of both project and non-project areas, fetch water from sources located outside the premises on an average of 2.7 times a day. Average travel time is 6.4 minutes per trip and another 7.9 minutes for waiting at the sources. There is no difference between project and non-project areas. While almost all members of the household fetch water, male head and female spouse of the head are mostly engaged in collecting water. The households in project areas are spending more than double in purchasing water compared to non-project areas (₹309 vs. ₹132 per month) and more (18% vs. 6%) are complaining about muscle strain from carrying water.

The estimated incidence of arsenic poisoning, fluorosis, water salinity, and health-related issues is comparable to the documented estimates found during project preparation. Overall, 9.24% population of the project areas were arsenic- and fluoride-affected. The survey finds that 8% of the currently and previously affected population in North and South 24 Parganas are affected by arsenic contamination, 22% of the population in Bankura are fluoride-affected, and 7% of the population in Purba Medinipur has high blood pressure. The incidence of arsenic or fluoride contamination is more visible in project blocks than in non-project blocks.
Majority of the households have their own toilet facility (96%), with pit latrine being the predominant type of toilet. On hygiene habits of after-toilet use 43% people in project gram panchayats practice handwashing with soap compared to 31% people of non-project gram panchayats.

The incidence of diarrhea among children under five years old is lower (2.3%) compared to 5.9% reported in the NFHS-4. The treatment households reportedly have higher incidence of diarrhea among children under five years old compared to comparison households (3.7% vs. 1%).

On average, more than two members are engaged in economically productive and paid work in a family. The reported average monthly labor market income is ₹12,909. There is no significant difference between project and non-project households in the number of working members and in labor market income. The survey also finds that households spend an average of ₹8,233 per month. Project households were found to spend more, and their expenditure shares are also significantly different from non-project households except for education, water, and house rent.

The post-project impact evaluation survey will use both qualitative and quantitative methods and enable an assessment of impact of proposed interventions against the baseline data presented in this report.
I. INTRODUCTION

1. The West Bengal Drinking Water Sector Improvement Project (WBDWSIP or the project) aims to achieve safe, sustainable, and inclusive drinking water services as per standards set by the Government of India to about 1.65 million people in the arsenic-, fluoride-, and salinity-affected areas of Bankura, North 24 Parganas, south 24 Parganas and Purba Medinipur districts of West Bengal.¹

2. The project contributes to ensuring drinking water security in West Bengal.² The project will construct climate-resilient drinking water infrastructure and strengthen institutions and capacity of stakeholders on drinking water service delivery. Household metered connections will be set up on a district metering area basis through 4,800 kilometers of water distribution network. Three treatment plants and 110 storage reservoirs will be built—all equipped with smart water management devices and connected to a central SCADA³ based monitoring system. The project has also institutionalized an innovative, inclusive, and sustainable service delivery model, wherein a state-level body, the Public Health Engineering Department (PHED), will manage the bulk water delivery facilities, and the respective gram panchayats will manage the distribution network and services within the villages.

3. This report provides and analyzes the baseline data and information for the impact evaluation of the project to be carried out at project completion. The sampling scheme, guided by the prospective impact evaluation design, takes into account the project’s implementation design. The survey is guided by a theory of change and covers both background and outcome indicators of the project impact at the intermediate and final outcome levels. This report presents the key results of the baseline evaluation data generated.

II. BACKGROUND

A. Theory of Change

4. Inputs. The inputs of the project include a sector loan from ADB ($240 million), cofinancing from the government of West Bengal ($109 million), a grant from ADB’s Japan Poverty Reduction Fund ($3 million), and a technical assistance grant ($2 million) from ADB’s Urban Financing Partnership Facility to all outputs.

5. Outputs. The project has two main outputs: (i) climate-resilient drinking water infrastructure constructed; and (ii) institutions and capacity of stakeholders for drinking water service delivery strengthened. Connection to continuous piped water supply at no cost will be set up for each household, and capacity building will be provided, including extensive hygiene awareness and livelihood improvement programs.

¹ ADB. 2018. Report and Recommendation of the President to the Board of Directors for West Bengal Drinking Water Sector Improvement Project, India. Manila. https://www.adb.org/projects/documents/ind-49107-006-rrp.
² Government of West Bengal, Public Health Engineering Department. 2011. Vision 2020: To Provide Safe, Sustainable, and Adequate Water Supply to All Humans and Livestock in West Bengal by 2020. Kolkata; and Government of India, Ministry of Drinking Water and Sanitation. 2016. National Sub-Mission Guidelines to Provide Safe Drinking Water to Arsenic and Fluoride Affected Habitations in Rural India on Mission Mode. New Delhi.
³ A control system architecture (comprising computers, networked data communications, instruments) which allows for input data to be processed (collected, captured, transferred) and analyzed for supervisory management based on (programmable) logic to interface with process plant or machinery.
6. **Outcomes.** The project aims to achieve safe, sustainable, and inclusive drinking water services as per standards set by the Government of India to about 1.65 million people in the arsenic-, fluoride-, and salinity-affected areas of Bankura, North 24 Parganas, and Purba Medinipur districts of West Bengal. Among the intermediate results expected are time saved from water fetching and a decline in arsenic, fluoride, and salinity concentration in water supply. These in turn will improve school attendance and reduce absences, prevent water borne diseases minimizing medical expenses, and decrease workdays lost due to morbidity. Eventually, all of these are anticipated to raise income, consumption, morbidity-free days, education attainment, and life expectancy. It should be noted that educational attainment and life expectancy are longer-term outcomes that maybe outside the scope of the impact evaluation.

7. **Assumptions.** For the outcomes to be realized, it is assumed that (i) project implementers will spend loan, grant, and technical assistance funds for the planned improvement of water supply and sanitation facilities and the conduct of sanitation awareness programs; (ii) the piped water supply will indeed reduce the arsenic, fluoride contamination in water supply; (iii) households exposed to sanitation awareness intervention will convert what they learned into desired sanitation practices; and (iv) the time saved from piped water connection and lower morbidity incidence will be used by children to be in school and by working age adults to engage in productive work (Figure 1).

B. **Proposed Impact Evaluation Design**

8. Considering the project’s implementation plan, the impact evaluation will use a matched difference-in-difference method. It will require baseline and follow-up surveys of households residing in project and matched non-project villages. There will be double matching—one at the block and/or the gram panchayat level and another at the household level—using pre-intervention characteristics. In addition to the matching of the block and/or gram panchayat during sampling, households in project and non-project gram panchayats will also be matched based on their baseline characteristics at estimation.

9. Impact evaluation requires a counterfactual observation to provide information on the outcomes of interest in the absence of the intervention. It is therefore critical that appropriate counterfactual observation units be identified preferably before project implementation. As designed, the project areas have been pre-selected, and implementation will not be done randomly. Hence, a randomized control trial, the gold standard in identifying the counterfactual for impact evaluations, cannot be implemented for this project. It was also mentioned that households in project villages will be connected to the water system all at once on a village-by-village basis upon completion of the construction of the water facilities. Connection to the water system will be done at no cost to the households. However, as mentioned earlier, not all blocks in each project district will be covered by the project. Households in non-project blocks therefore are the best potential subject for counterfactual observation. To identify the counterfactual households, a two-level matching was done. First, non-project blocks that closely match the project blocks were selected. Secondly, the gram panchayats within the selected non-project blocks were matched with selected gram panchayats in project blocks. The matching uses block and gram panchayats characteristics such as number of households, total land area, number of villages (only at the block level), population density, proportion of area irrigated, proportion of the population in scheduled caste, proportion of the population in scheduled tribe, proportion of illiterate population, proportion of working population, and proportion of the households with tap water. The treatment households will be randomly selected from the randomly selected villages in the treatment blocks. Similarly, from the randomly selected villages in the matched counterfactual blocks, the counterfactual households will be selected.
Figure 1: Theory of Change—West Bengal Drinking Water Sector Improvement Project

### Inputs
- Investment
- Sector loan to finance physical improvements
- Technical assistance
- Local awareness campaign

### Outputs
- Immediate output: Water treatment plants constructed
- Intermediate output: Water distribution network built
- Immediate output: Pilot fecal/sludge septage plant built
- Intermediate output: Local population reported increased awareness of water sanitation and hygiene

### Outcomes
- Immediate outcome: Households connected to better quality piped water
- Intermediate outcome: Households connected to better toilet facilities
- Final outcome: Households use better toilet facilities

### Impact
- Incomes increased
- Time spent (and cost?) to access water decreased
- Incidence of arsenic/fluoride or other waterborne diseases decreased
- Incidence of sanitation-related diseases decreased
- School attendance improved
- Medical expenses of households decreased
- Workdays lost decreased
- Households use better quality and more accessible piped water

### Assumptions and issues
- Assumes current set up involves lengthy trips to fetch water from hand pump
- Assumes local population sees the advantage and have no social/security barriers for using the facilities
- Assumes they can afford the services and see advantage as opposed to fetching water from hand pump

### Source
Asian Development Bank
C. Data Generation

10. To come up with indicators of interest for the prospective impact evaluation, a household survey on the treatment and comparison households was designed prior to project implementation. A survey questionnaire was prepared taking into account the following general factors: demography, education, health, household or community work, job market work, water supply, sanitation facilities, income, expenditure, housing characteristics and assets (Appendix 1).

11. A local survey firm was contracted to conduct the survey. The survey field work was implemented from January to August 2019. A tablet-based survey was undertaken with two teams working simultaneously within the same block to complete the survey within time frame. Each surveyor was given a hands-on training on conducting tablet-based survey to avoid error in the field as much as possible. The survey teams were accompanied by gram panchayat members in charge of each of the constituent villages of the surveyed gram panchayats.

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4 ABAR Conseil.
5 The tablet-based survey provides some lessons on its definite advantage: (i) GPS locations of households are simultaneously taken and household survey is made faster, (ii) each field has to be filled, thus there is no chance of skipping a field and/or no room for manipulating the data, (iii) considerable time in data entry could be saved, (iv) automated database generation, and (v) real time updates. However, the lack of internet connection in many interior rural areas has posed a problem in operation.
D. Limitations of Study

12. The baseline evaluation survey was conducted with expected project outcomes and outputs in view. The survey design, scheduling, and survey enumerator selection and training were done accordingly. The following hurdles were encountered during the conduct of the survey:

(i) The survey schedule had to be postponed due to impending general election in the country and the state; and post-poll violence also hindered smooth survey operation—causing some changes in the selection of gram panchayats and non-project blocks.

(ii) Tablet-based survey had suffered unintended difficulty in android device operation in interior rural areas where network was either absent or frequently interrupted. Lack of basic technical knowledge among the surveyors on water supply sources and sanitation system and its health-related issues posed difficulty in understanding basic issues prevalent in the study area.

(iii) Briefing by a public health expert would have facilitated quicker understanding of the survey tool by the surveyors.

III. BASELINE SURVEY RESULTS

13. The baseline survey results are described with relevant background and outcome indicators by domain. To provide a benchmark of how the survey respondents compare with reference households of interest, indicators are compared with known household surveys conducted for the area. For this, the survey team used the latest version of the NFHS-4 for West Bengal (2015–2016). Since the baseline survey will be prospectively used for a rigorous impact evaluation in the future, the balance of the project and non-project households in the indicators of interests are also discussed. A test of a difference in means are conducted for all indicators to determine if there are significant differences between project and non-project areas.

A. Geographic Distribution of the Sample

14. The sampling targeted around 2,000 households distributed proportionately according to the number of households across randomly selected gram panchayats in project districts and their matched counterparts in non-project districts (Appendix 2). The survey covered a smaller number of gram panchayats in the project areas than what has been planned, but this reduction was compensated by increasing the number of sample households by constituent villages of each gram panchayat. Adjustments were made in the field to consider existing situations in the survey areas.

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6 International Institute for Population Sciences (IIPS) Mumbai and ICF. 2017. National Family Health Survey (NFHS-4), India, 2015-16: West Bengal. Mumbai.

7 The sampling units are gram panchayats.
Table 1: Distribution of Sample by Districts and Gram Panchayats

| District                      | Project |                |                | Non-Project |                |                | Total |                |                |                |
|-------------------------------|---------|----------------|----------------|-------------|----------------|----------------|-------|----------------|----------------|----------------|
|                               | Gram    | Households     | Gram           | Households  | Gram           | Households     |       |                |                |                |
| North (and South) 24 Parganas | 11      | 438            | 11             | 424         | 22             | 862            |       |                |                |                |
| Bankura                       | 5       | 150            | 5              | 155         | 10             | 305            |       |                |                |                |
| Purba Medinipur               | 12      | 420            | 13             | 426         | 25             | 846            |       |                |                |                |
| Total                         | 28      | 1,008          | 29             | 1,005       | 57             | 2,013          |       |                |                |                |

Source: Asian Development Bank.

15. Table 1 shows the distribution of sample households and gram panchayats by district. The survey covered a total of 57 gram panchayats and 2,013 households distributed as follows: (i) 28 gram panchayats with a total of 1,008 households in project areas, and (ii) 29 gram panchayats with 1,005 households in non-project areas.

B. Background Information

B1. Demographic Characteristics

16. Household Composition. The sample shows an average household size of 4.15 members (Table 2). This average is slightly smaller than the 2015–2016 NFHS-4 reported average family size of 4.3 members. Project areas show a significantly higher average household size of 4.22 compared to 4.08 in non-project areas. For this the survey team used the latest version of NFHS-4 for West Bengal (2015–2016).

17. There is a slightly higher proportion of males (54.0%) compared to females. This is slightly different from the 2015–2016 NFHS-4 data which reported a higher proportion of females (50.3%). However, there is no significant difference in the proportion of males to females between project and non-project areas (footnote 6).

18. About 19% of the population is under 15 years old. This proportion is smaller than those reported in the 2015–2016 NFHS-4 (26%). Five percent of the population is 65 years old and above with no significant difference between project and non-project areas. This proportion is also smaller than the 2015–2016 NFHS-4 data (7%).

19. Majority of the sample either had education up to class 4 (27%) or class 8 (21%). Eighteen percent is illiterate. About 9% finished up to class 12. Only 4% completed a college degree or higher. Slightly over 6% completed technical education. There appears to be a significantly higher proportion of college graduates or higher in the project areas compared to non-project areas.
Table 2: Demographic Characteristics of the Sample

| Variable         | Mean Total | Obs. Project | Mean Obs. | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|------------------|------------|--------------|-----------|------------------|------------------|-------|-------|-------|
| Household size   | 4.154      | 2,013        | 4.225     | 1,008            | 4.083            | 1,005 | 0.143 | 2.362 | 0.018 |
| Members, male    | 0.537      | 8,362        | 0.544     | 4,259            | 0.529            | 4,103 | 0.015 | 1.344 | 0.179 |
| Under 15 years   | 0.192      | 8,362        | 0.189     | 4,259            | 0.194            | 4,103 | -0.006 | -0.664 | 0.507 |
| 65 years old and | 0.054      | 8,362        | 0.056     | 4,259            | 0.052            | 4,103 | 0.003 | 0.656 | 0.512 |
| Illiterate       | 0.180      | 8,284        | 0.179     | 4,241            | 0.182            | 4,043 | -0.003 | -0.333 | 0.739 |
| Educ. Up to class 4 | 0.273 | 8,284        | 0.265     | 4,241            | 0.280            | 4,043 | -0.003 | -0.333 | 0.739 |
| Educ. Up to class 8 | 0.212 | 8,284        | 0.214     | 4,241            | 0.211            | 4,043 | 0.003 | 0.374 | 0.708 |
| Educ. Up to class 10 | 0.140 | 8,284        | 0.145     | 4,241            | 0.134            | 4,043 | 0.012 | 1.532 | 0.126 |
| Educ. Up to class 12 | 0.086 | 8,284        | 0.083     | 4,241            | 0.089            | 4,043 | -0.007 | -1.059 | 0.289 |
| Educ. Bachelors and above | 0.043 | 8,284 | 0.049 | 4,241 | 0.037 | 4,043 | 0.012 | 2.673 | 0.008 |
| Educ. Technology | 0.063      | 8,284        | 0.063     | 4,241            | 0.064            | 4,043 | 0.000 | -0.070 | 0.944 |

Diff. = difference, Educ. = education, Obs. = observed, P-Val. = probability value, T-Val. = T-value.
Source: Asian Development Bank.

20. **Characteristics of the household head.** Majority of the household heads are male (92%) and between 41 to 64 years old (59%) or on average, 50 years old (Table 3). Most of them either completed up to class 4 (31%), class 8 (21%), or are illiterate (28%). It is noteworthy that except for the proportion with bachelor’s degrees and above where project areas show a significantly higher proportion compared to non-project areas (6% vs. 3%), the other characteristics of the household heads are similar.

Table 3: Demographic Characteristics of the Household Head

| Variable         | Mean Total | Obs. Project | Mean Obs. | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|------------------|------------|--------------|-----------|------------------|------------------|-------|-------|-------|
| Members, male    | 0.922      | 2,013        | 0.925     | 1,008            | 0.919            | 1,005 | 0.005 | 0.435 | 0.664 |
| Age              | 50.211     | 2,013        | 50.419    | 1,008            | 50.002           | 1,005 | 0.417 | 0.737 | 0.461 |
| Age 16–40        | 0.260      | 2,013        | 0.254     | 1,008            | 0.266            | 1,005 | 0.005 | 0.435 | 0.664 |
| Age 41–64        | 0.589      | 2,013        | 0.595     | 1,008            | 0.583            | 1,005 | 0.012 | 0.554 | 0.580 |
| 65 years old and | 0.151      | 2,013        | 0.151     | 1,008            | 0.151            | 1,005 | 0.000 | -0.028 | 0.978 |
| Illiterate       | 0.286      | 1,981        | 0.277     | 1,004            | 0.296            | 977   | -0.019 | -0.931 | 0.352 |
| Educ. up to class 4 | 0.313 | 1,981 | 0.302 | 1,004 | 0.324 | 977 | -0.023 | -1.088 | 0.277 |
| Educ. up to class 8 | 0.213 | 1,981 | 0.211 | 1,004 | 0.214 | 977 | -0.003 | -0.150 | 0.881 |
| Educ. up to class 10 | 0.098 | 1,981 | 0.107 | 1,004 | 0.089 | 977 | 0.018 | 1.312 | 0.190 |
| Educ. up to class 12 | 0.045 | 1,981 | 0.047 | 1,004 | 0.043 | 977 | 0.004 | 0.411 | 0.681 |
| Educ. Bachelors and above | 0.044 | 1,981 | 0.057 | 1,004 | 0.031 | 977 | 0.026 | 2.835 | 0.005 |
| Educ. Technology | 0.000      | 1,981        | 0.000     | 1,004            | 0.000            | 977   | 0.000 | 0.000 |

Diff. = difference, Educ. = education, Obs. = observed, P-Val. = probability value, T-Val. = T-value.
Source: Asian Development Bank.
21. **Distribution across classes.** Table 4 shows the distribution of the sample by classes. Majority of the households in the sample (44%) belong to the general class. Twenty one percent are members of scheduled caste, 12% classify themselves under other backward classes. While 2% are members of scheduled tribe, 22% are classified as others. There is a significant difference between the project and non-project areas in terms of the proportion of members belonging to the general class (39% vs. 49%) and those belonging to scheduled class (24% vs. 18%). This may have some effects on the outcomes and will be used to discuss whatever differences will be found subsequently.

**Table 4: Distribution of Respondents by Classes**

| Variable            | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val | P-Val |
|---------------------|------------|------------|--------------|--------------|------------------|------------------|-------|-------|-------|
| General             | 0.438      | 2,013      | 0.390        | 1,008        | 0.486            | 1,005            | -0.096| -4.345| 0.000 |
| Scheduled caste     | 0.212      | 2,013      | 0.241        | 1,008        | 0.183            | 1,005            | 0.058 | 3.188 | 0.001 |
| Scheduled tribe     | 0.016      | 2,013      | 0.021        | 1,008        | 0.012            | 1,005            | 0.009 | 1.571 | 0.116 |
| Other backward classes | 0.118    | 2,013      | 0.131        | 1,008        | 0.104            | 1,005            | 0.026 | 1.843 | 0.065 |
| Others              | 0.216      | 2,013      | 0.217        | 1,008        | 0.215            | 1,005            | 0.002 | 0.127 | 0.899 |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

**B2. Housing Characteristics**

22. The average house area is 43 square meters with an average value of ₹297,000 (Table 5). The average number of rooms is a little over two, 5% have a garden, while 56% have a separate kitchen. By type of house, 41% of the houses are permanent, the other 33% are temporary, and the rest are semi-permanent (26%).

23. Comparing projects and non-project areas shows that there is no significant difference in the house value and proportion with garden. There are, however, significant differences in house area, the number of rooms, and the proportion with separate kitchen. Households in project areas have houses with smaller sizes but have more rooms and have a higher proportion with separate kitchen.

24. **Cooking fuel used.** The most common fuel used for cooking are cow dung, firewood, and/or dry leaves (78%). This is followed by liquefied petroleum gas (LPG) (19%). A much smaller proportion of households use kerosene (2%).

25. Comparing project and non-project households shows no significant difference in most cooking fuel used except for LPG and kerosene. A higher proportion of households in project areas uses LPG and a lesser proportion uses kerosene.

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8 “Other backward class” (OBC) is a collective term used by the Government of India to classify castes which are educationally or socially backward.
### Table 5: Housing Characteristics

| Variable                        | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff       | T-Val  | P-Val |
|--------------------------------|------------|------------|--------------|--------------|------------------|------------------|------------|--------|-------|
| House area (sq. m.)            | 42.873     | 2,009      | 39.309       | 1,007        | 46.455           | 1,002            | -7.145    | -2.944 | 0.003 |
| House value (₹)                | 296,911.548| 2,001      | 282,541.757  | 1,006        | 311,440.201      | 995              | -28,898.444| -1.197 | 0.231 |
| Number of rooms                | 2.335      | 2,010      | 2.414        | 1,008        | 2.256            | 1,002            | 0.157   | 3.474  | 0.001 |
| With garden                    | 0.048      | 1,973      | 0.046        | 1,008        | 0.050            | 965              | -0.004   | -0.428 | 0.669 |
| With separate kitchen          | 0.559      | 2,010      | 0.602        | 1,007        | 0.515            | 1,003            | 0.086   | 3.910  | 0.000 |
| Type of house                  |            |            |              |              |                  |                  |          |        |       |
| Permanent                      | 0.410      | 2,011      | 0.423        | 1,008        | 0.397            | 1,003            | 0.026    | 1.177  | 0.240 |
| Temporary                      | 0.335      | 2,011      | 0.334        | 1,008        | 0.335            | 1,003            | -0.001   | -0.032 | 0.975 |
| Semi-permanent                 | 0.256      | 2,011      | 0.243        | 1,008        | 0.268            | 1,003            | -0.025   | -1.292 | 0.196 |
| Type of cooking fuel used      |            |            |              |              |                  |                  |          |        |       |
| Cow dung, firewood, dry leaves | 0.784      | 2,008      | 0.769        | 1,007        | 0.800            | 1,001            | -0.032   | -1.721 | 0.085 |
| LPG                            | 0.188      | 2,008      | 0.215        | 1,007        | 0.161            | 1,001            | 0.055    | 3.139  | 0.002 |
| Kerosene                       | 0.023      | 2,008      | 0.012        | 1,007        | 0.035            | 1,001            | -0.023   | -3.424 | 0.001 |
| Coal                           | 0.002      | 2,008      | 0.004        | 1,007        | 0.001            | 1,001            | 0.003    | 1.337  | 0.182 |
| Biogas                         | 0.001      | 2,008      | 0.000        | 1,007        | 0.002            | 1,001            | -0.002   | -1.419 | 0.156 |
| Electricity                    | 0.000      | 2,008      | 0.000        | 1,007        | 0.001            | 1,001            | -0.001   | -1.003 | 0.316 |

Diff. = difference, Educ. = education, LPG = liquified petroleum gas, Obs. = observed, P-Val = probability value, T-Val = T-value.

Source: Asian Development Bank.

### C. Intermediate and Final Outcomes

#### C.1 Water Supply Source

##### C.1.1 Water for potable uses

26. **Drinking water.** The three major sources of drinking water for the sample households include tube well or bore well (42%), public hand pump (34%), and private hand pump (13%) (Table 6). The other sources include public tap/stand post (5%) and bottled water (4%). Public tap/stand posts are part of rural water supply system initiatives of gram panchayats and the PHED. Under this system, water is drawn from ground water sources such as tube well, borewell, and small-scale reservoirs built with pipelines carrying water to certain designated locations for the households to get water from pipes/stand posts. This is predominantly found in Purba Medinipur and also in North 24 Parganas district. These water supply lines provide untreated water at regular and fixed intervals to the receiving points. Apart from this piped water supply, another important source is surface water.⁹ Significant differences between project and non-project areas are found with respect to three sources of drinking water. For public tube well, a lower proportion of households depends on it as a source in project areas than in non-project areas—a difference by 13 percentage points. For tube well, the proportion of households using it is higher by 6 percentage points in project areas than in non-project areas. For bottled water, the proportion is higher by 4 percentage points in project areas.

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⁹ Surface water is the water located above ground and includes rivers, dams, lakes, ponds, streams, canals, and irrigation channels. In the present context, ponds, rivers, tanks, and nala are included in the Surface Water category. These are untreated water sources.
27. **Handwashing.** The most dominant source of water for handwashing is also tube well or bore well (32%). The next prevalent source is surface water (30%), followed by private hand pump (21%). A few households use water from public hand pump (13%).\(^{10}\) Significant differences between project and non-project areas are in all sources except for use of water supplied through tankers. On handwashing, comparison of project and non-project gram panchayats indicates that more people in project gram panchayats (43%) practice hygienic handwashing with soap after use of toilet, than in non-project gram panchayats (31%). On usage of soap, 49% of the population wash hands without soap and 36% wash their hands with soap.

28. **Cooking.** For cooking, the primary sources are the same as those for drinking water, namely tube well/bore well (43%), public hand pump (30%), and private hand pump (17%). Significant differences exist between project and non-project areas for most sources except for public tap/stand post, tanker, and bottled water.

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\(^{10}\) Tube wells and hand pumps are bore holes used for extracting ground water. When a pump is operated by electric power, it is called a tube well, and when operated manually, it is known as a handpump. See Ministry of Statistics and Programme Implementation, National Statistical Office, Government of India. 2018. *Drinking Water, Sanitation, Hygiene and Housing Condition in India.* Report No. 584 (76/1.2/7). NSS 76th Round. July–December.
C.1.2 Water for non-potable uses

29. **Toilet.** Surface water is the primary source of water for toilet use by households (55%). The two other major sources include private hand pump (22%) and tube well/bore well (15%). Significant differences between project and non-project areas are found in most sources including tube well/bore well, dug well, surface water, and public and private tube well.

C.1.3 Water for other uses

30. **Gardening.** For gardening, a large proportion of households (66%) uses untreated surface water from ponds, tanks, and nala (canals). The other popular sources among households include tube well/bore well (18%) and private hand pump (9%). There are no significant differences in all sources between project and non-project areas. Very few of the households in Purba Medinipur with nursery as main livelihood are reportedly dependent on bottled water instead of locally available saline water.

31. **Other domestic uses.** As with toilet use and gardening, surface water is also the primary source of water for other domestic uses (55%). The other major sources include private tube well (22%) and tube well/bore well (14%). There are significant differences in most sources of water between project and non-project areas except for public tap/stand post and bottled water.

32. **Livestock.** Surface water is also the primary source of water used for livestock (63%). Other major sources include private hand pump (19%) and tube well/bore well (11%). There are no significant differences in most sources between project and non-project areas except for dug well, surface, and private tube well.

33. It is also very likely that the water use and sources will be affected by the community’s water and sanitation habits, which can be influenced by religion, customs, and practices. While this may not be evident in the survey data, it came out during the survey interviews. For example, people of water scarce villages, such as in Bankura, cannot always afford to practice proper hygiene and sanitation. The lack of water may act as a deterrent to behavioral change. In this context, a few outlier cases, such as the unorthodox use of bottled water, have surfaced in the survey. The survey also encountered a few households whose main livelihood is animal rearing (e.g., dog breeding or goat rearing for sale); they assert to use bottled water for the animals as contaminated drinking water might be detrimental for commercial enterprises. Similarly, a few floriculturists in Purba Medinipur claim to use bottled water for the nursery as local saline water could harm the crop growth.
Table 6: Sources of Water in Project and Non-Project Areas by Type of Use

| Variable                              | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|---------------------------------------|------------|------------|--------------|--------------|-----------------|-----------------|-------|--------|--------|
| **Potable uses**                      |            |            |              |              |                 |                 |       |        |        |
| Tap, pipe in yard, plot (supply system) | 0.004      | 2,010      | 0.002        | 1,008        | 0.007           | 1,002           | -0.005 | -1.680 | 0.093  |
| Public tap, stand post (supply system) | 0.055      | 2,010      | 0.064        | 1,008        | 0.045           | 1,002           | 0.020  | 1.930  | 0.054  |
| Tube well or bore well                | 0.430      | 2,010      | 0.460        | 1,008        | 0.399           | 1,002           | 0.061  | 2.771  | 0.006  |
| Dug well                              | 0.000      | 2,010      | 0.001        | 1,008        | 0.000           | 1,002           | 0.001  | 0.997  | 0.319  |
| Tanker (supply system)                | 0.001      | 2,010      | 0.002        | 1,008        | 0.000           | 1,002           | 0.002  | 1.411  | 0.158  |
| Surface                               | 0.000      | 2,010      | 0.000        | 1,008        | 0.001           | 1,002           | -0.001 | -1.003 | 0.316  |
| Bottled (supply mode)                 | 0.040      | 2,010      | 0.061        | 1,008        | 0.020           | 1,002           | 0.041  | 4.645  | 0.000  |
| Public hand pumpb                     | 0.341      | 2,010      | 0.276        | 1,008        | 0.407           | 1,002           | -0.131 | -6.269 | 0.000  |
| Private hand pumpc                    | 0.127      | 2,010      | 0.134        | 1,008        | 0.121           | 1,002           | 0.013  | 0.885  | 0.376  |
| **Handwashing**                       |            |            |              |              |                 |                 |       |        |        |
| Tap, pipe in yard, plot (supply system) | 0.005      | 1,995      | 0.001        | 999          | 0.008           | 996             | -0.007 | -2.345 | 0.019  |
| Public tap, stand post (supply system) | 0.030      | 1,995      | 0.038        | 999          | 0.021           | 996             | 0.017  | 2.237  | 0.025  |
| Tube well or bore well                | 0.317      | 1,995      | 0.356        | 999          | 0.278           | 996             | 0.078  | 3.766  | 0.000  |
| Dug well                              | 0.012      | 1,995      | 0.024        | 999          | 0.000           | 996             | 0.024  | 4.949  | 0.000  |
| Tanker (supply system)                | 0.001      | 1,995      | 0.001        | 999          | 0.000           | 996             | 0.001  | 0.998  | 0.318  |
| Surface                               | 0.296      | 1,995      | 0.258        | 999          | 0.333           | 996             | -0.075 | -3.684 | 0.000  |
| Public hand pump                      | 0.128      | 1,995      | 0.075        | 999          | 0.182           | 996             | -0.107 | -7.210 | 0.000  |
| Private hand pump                     | 0.212      | 1,995      | 0.246        | 999          | 0.178           | 996             | 0.069  | 3.756  | 0.000  |
| Tap, pipe in yard, plot (supply system) | 0.005      | 1,977      | 0.001        | 981          | 0.008           | 996             | -0.007 | -2.318 | 0.021  |
| Public tap, stand post (supply system) | 0.053      | 1,977      | 0.062        | 981          | 0.044           | 996             | 0.018  | 1.785  | 0.074  |
| Tube well or bore well                | 0.431      | 1,977      | 0.484        | 981          | 0.380           | 996             | 0.105  | 4.723  | 0.000  |
| Dug well                              | 0.008      | 1,977      | 0.016        | 981          | 0.000           | 996             | 0.016  | 4.062  | 0.000  |
| Tanker (supply system)                | 0.001      | 1,977      | 0.001        | 981          | 0.000           | 996             | 0.001  | 1.008  | 0.314  |
| Surface                               | 0.032      | 1,977      | 0.018        | 981          | 0.046           | 996             | -0.028 | -3.506 | 0.000  |
| Bottled (supply mode)                 | 0.003      | 1,977      | 0.005        | 981          | 0.001           | 996             | 0.004  | 1.654  | 0.098  |
| Public hand pump                      | 0.295      | 1,977      | 0.203        | 981          | 0.387           | 996             | -0.184 | -9.134 | 0.000  |
| Private hand pump                     | 0.171      | 1,977      | 0.209        | 981          | 0.135           | 996             | 0.074  | 4.409  | 0.000  |

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| Variable                        | Mean Total | Obs. Project | Mean Project | Mean Non-Project | Mean Non-Project | Diff. | T-Val. | P-Val. |
|--------------------------------|------------|--------------|--------------|------------------|------------------|-------|-------|--------|
| **Non-potable uses**           |            |              |              |                  |                  |       |       |        |
| Toilet                         |            |              |              |                  |                  |       |       |        |
| Tap, pipe in yard, plot (supply system) | 0.002 | 1,911 | 0.001 | 930 | 0.002 | 981 | -0.001 | -0.5315 | 0.595 |
| Public tap, stand post (supply system) | 0.011 | 1,911 | 0.014 | 930 | 0.008 | 981 | 0.006 | 1.2204 | 0.222 |
| Tube well or bore well         | 0.152 | 1,911 | 0.194 | 930 | 0.112 | 981 | 0.081 | 4.9879 | 0.000 |
| Dug well                       | 0.013 | 1,911 | 0.026 | 930 | 0.000 | 981 | 0.026 | 5.0951 | 0.000 |
| Tanker (supply system)         | 0.001 | 1,911 | 0.001 | 930 | 0.000 | 981 | 0.001 | 1.0271 | 0.305 |
| Surface                        | 0.547 | 1,911 | 0.469 | 930 | 0.621 | 981 | -0.152 | -6.7462 | 0.000 |
| Bottled (Supply mode)          | 0.001 | 1,911 | 0.000 | 930 | 0.001 | 981 | -0.001 | -0.9736 | 0.330 |
| Public handpump                | 0.060 | 1,911 | 0.038 | 930 | 0.081 | 981 | -0.043 | -3.9715 | 0.000 |
| Private hand pump              | 0.215 | 1,911 | 0.258 | 930 | 0.174 | 981 | 0.084 | 4.4748 | 0.000 |
| Gardening                      |            |              |              |                  |                  |       |       |        |
| Tap, pipe in yard, plot (supply system) | 0.011 | 94 | 0.017 | 58 | 0.000 | 36 | 0.017 | 0.786 | 0.434 |
| Tube well or bore well         | 0.181 | 94 | 0.224 | 58 | 0.111 | 36 | 0.113 | 1.383 | 0.170 |
| Dug well                       | 0.043 | 94 | 0.069 | 58 | 0.000 | 36 | 0.069 | 1.616 | 0.110 |
| Surface                        | 0.660 | 94 | 0.603 | 58 | 0.750 | 36 | -0.147 | -1.459 | 0.148 |
| Bottled (Supply mode)          | 0.011 | 94 | 0.000 | 58 | 0.028 | 36 | -0.028 | -1.274 | 0.206 |
| Public handpump                | 0.011 | 94 | 0.017 | 58 | 0.000 | 36 | 0.017 | 0.786 | 0.434 |
| Private hand pump              | 0.085 | 94 | 0.069 | 58 | 0.111 | 36 | -0.042 | -0.706 | 0.482 |
| Other domestic uses            |            |              |              |                  |                  |       |       |        |
| Public tap, stand post (supply system) | 0.011 | 1,855 | 0.013 | 910 | 0.010 | 945 | 0.004 | 0.745 | 0.456 |
| Tube well or bore well         | 0.140 | 1,855 | 0.175 | 910 | 0.106 | 945 | 0.069 | 4.299 | 0.000 |
| Dug well                       | 0.011 | 1,855 | 0.022 | 910 | 0.000 | 945 | 0.022 | 4.606 | 0.000 |
| Surface                        | 0.551 | 1,855 | 0.487 | 910 | 0.613 | 945 | -0.126 | -5.490 | 0.000 |
| Bottled (Supply mode)          | 0.002 | 1,855 | 0.002 | 910 | 0.001 | 945 | 0.001 | 0.610 | 0.542 |
| Public handpump                | 0.064 | 1,855 | 0.037 | 910 | 0.090 | 945 | -0.053 | -4.645 | 0.000 |
| Private hand pump              | 0.222 | 1,855 | 0.264 | 910 | 0.181 | 945 | 0.083 | 4.311 | 0.000 |
| Livestock                      |            |              |              |                  |                  |       |       |        |
| Tap, pipe in yard, plot (supply system) | 0.005 | 643 | 0.003 | 360 | 0.007 | 283 | -0.004 | -0.791 | 0.429 |
| Public tap, stand post (supply system) | 0.009 | 643 | 0.014 | 360 | 0.004 | 283 | 0.010 | 1.356 | 0.176 |
| Tube well or bore well         | 0.107 | 643 | 0.125 | 360 | 0.085 | 283 | 0.040 | 1.636 | 0.102 |

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### Table 6 continued

| Variable                  | Mean Total | Obs. Project | Mean Non-Project | Diff. | T-Val. | P-Val. |
|---------------------------|------------|--------------|------------------|-------|--------|--------|
| Dug well                  | 0.019      | 0.033        | 0.000            | 0.033 | 3.119  | 0.002  |
| Surface                   | 0.633      | 0.578        | 0.703            | -0.125| -3.297 | 0.001  |
| Bottled (supply mode)     | 0.002      | 0.003        | 0.000            | 0.003 | 0.886  | 0.376  |
| Public hand pump          | 0.034      | 0.025        | 0.046            | -0.021| -1.450 | 0.148  |
| Private hand pump         | 0.191      | 0.219        | 0.155            | 0.064 | 2.051  | 0.041  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T value.

a. Dug well has head wall built around the well with concrete drainage platform and a drainage channel, and a bucket with hand pump or windlass.

b. Public hand pump is the one constructed by the government, community, or organization, usually on government or community land or with the permission of some private individuals into their private-owned land. Everybody can draw water from it.

c. Private hand pumps are usually owned by an individual and it is within their private-owned land. The cost of construction and the maintenance is borne by the private individual. The private owner has the sole right over it and may not allow anybody outside to take water from it.

Source: Asian Development Bank.

### C.2 Water Pressure

34. Before going into details of water pressure, some local infrastructure set up for piped water supply may be elaborated to describe existing rural water supply system. In rural Bengal, piped water supply system is usually minimum. The PHED has recently started providing some piped water schemes at the community level or at stand posts. In some cases, the gram panchayats have taken the initiative to provide piped water supply to designated points in a village, generally at a public stand post, by drawing ground water from tube wells/bore wells, constructing small scale reservoirs, and supplying untreated water to some designated localities through pipelines. People from surrounding areas collect water from these points/stand posts mostly for drinking, cooking, and handwashing purposes. Some other uncommon uses are also visible. Water supply is restricted to a fixed schedule according to capacity of the reservoirs. While discussing water pressure and related issues, this piped water supply has been taken into consideration. Majority of the respondents who had their water tap near their premises indicated that they have good water pressure particularly for drinking water, handwashing, cooking, and livestock (Table 7). There are no significant differences in the assessment of water pressure in project and non-project areas except in handwashing and cooking, and for livestock.

### Table 7: Assessment of Water Pressure

| Variable | Mean Total | Obs. Project | Mean Non-Project | Diff. | T-Val. | P-Val. |
|----------|------------|--------------|------------------|-------|--------|--------|
| Drinking |            |              |                  |       |        |        |
| Good     | 0.645      | 0.651        | 0.635            | 0.015 | 0.356  | 0.722  |
| Fair     | 0.307      | 0.313        | 0.297            | 0.016 | 0.382  | 0.703  |
| Poor     | 0.048      | 0.037        | 0.068            | -0.031| -1.632 | 0.103  |

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Table 7 continued

| Variable     | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Handwashing  |            |            |              |              |                  |                  |       |        |        |
| Good         | 0.617      | 376        | 0.667        | 243          | 0.526            | 133              | 0.140 | 2.695  | 0.007  |
| Fair         | 0.335      | 376        | 0.317        | 243          | 0.368            | 133              | -0.052| -1.011 | 0.313  |
| Poor         | 0.048      | 376        | 0.016        | 243          | 0.105            | 133              | -0.089| -3.924 | 0.000  |
| Cooking      |            |            |              |              |                  |                  |       |        |        |
| Good         | 0.622      | 497        | 0.640        | 317          | 0.589            | 180              | 0.051 | 1.137  | 0.256  |
| Fair         | 0.330      | 497        | 0.331        | 317          | 0.328            | 180              | 0.003 | 0.079  | 0.937  |
| Poor         | 0.048      | 497        | 0.028        | 317          | 0.083            | 180              | -0.055| -2.762 | 0.006  |
| Toilet       |            |            |              |              |                  |                  |       |        |        |
| Good         | 0.466      | 133        | 0.530        | 66           | 0.403            | 67               | 0.127 | 1.473  | 0.143  |
| Fair         | 0.353      | 133        | 0.379        | 66           | 0.328            | 67               | 0.050 | 0.605  | 0.547  |
| Poor         | 0.180      | 133        | 0.091        | 66           | 0.269            | 67               | -0.178| -2.719 | 0.007  |
| Gardening    |            |            |              |              |                  |                  |       |        |        |
| Good         | 0.444      | 18         | 0.462        | 13           | 0.400            | 5                | 0.062 | 0.222  | 0.827  |
| Fair         | 0.389      | 18         | 0.385        | 13           | 0.400            | 5                | -0.015| -0.057 | 0.956  |
| Poor         | 0.167      | 18         | 0.154        | 13           | 0.200            | 5                | -0.046| -0.222 | 0.827  |
| Other domestic uses | | | | | | | | | |
| Good         | 0.476      | 105        | 0.482        | 56           | 0.469            | 49               | 0.013 | 0.129  | 0.897  |
| Fair         | 0.362      | 105        | 0.393        | 56           | 0.327            | 49               | 0.066 | 0.700  | 0.485  |
| Poor         | 0.162      | 105        | 0.125        | 56           | 0.204            | 49               | -0.079| -1.093 | 0.277  |
| Livestock    |            |            |              |              |                  |                  |       |        |        |
| Good         | 0.645      | 31         | 0.727        | 22           | 0.444            | 9                | 0.283 | 1.500  | 0.144  |
| Fair         | 0.194      | 31         | 0.273        | 22           | 0.000            | 9                | 0.273 | 1.777  | 0.086  |
| Poor         | 0.161      | 31         | 0.000        | 22           | 0.556            | 9                | -0.556| -5.072 | 0.000  |

Diff. = difference, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

C.3 Hours of Water Availability

35. For those depending on public water supply sources, water available for a variety of uses ranges from 20 to 44 hours per week (Table 8). For both potable and non-potable uses of water, such as handwashing, drinking, toilet use, cooking, washing and cleaning, water is available for 40 to 44 hours per week. For other uses such as for livestock and other domestic purposes, the availability of water supply is lower, ranging from 20 to 31 hours per week. The number of available hours for water supply is significantly lower in project areas compared to non-project areas particularly for drinking, handwashing, and cooking. Use of piped water from local pipeline network for livestock is very limited for a few of the households engaged in specialized commercial enterprises like dog breeding.
### Table 8: Hours of Supply Per Week

| Variable        | Mean | Total | Obs. Mean | Total | Project | Obs. | Non-Project | Obs. | Dif. | T-Val. | P-Val. |
|-----------------|------|-------|-----------|-------|---------|------|-------------|------|------|--------|--------|
| Drinking        | 42.01| 177   | 23.448    | 96    | 64.012  | 81   | -40.56      | -5.610| 0.000|
| Handwashing     | 43.75| 106   | 23.967    | 60    | 69.565  | 46   | -45.60      | -4.806| 0.000|
| Cooking         | 39.78| 165   | 24.674    | 89    | 57.474  | 76   | -32.80      | -4.455| 0.000|
| Toilet          | 40.80| 25    | 51.500    | 16    | 21.778  | 9    | 29.72       | 1.499 | 0.147|
| Other domestic uses | 31.00| 23    | 37.385    | 13    | 22.700  | 10   | 14.68       | 1.126 | 0.273|
| Livestock       | 19.78| 9     | 20.500    | 8     | 14.000  | 1    | 6.50        | NA   | NA   |

Diff. = difference, Obs. = observed, NA = not applicable, P-Val = probability value, T-Val = T-value.

Source: Asian Development Bank.

### C.4 Water Supply Breakdowns

36. On the use of water for drinking and cooking, the highest number of breakdowns (average of two) occurred in 2018 (Table 9). Water supply for livestock use and gardening had the least frequency of breakdowns. There are no significant differences between the number of breakdowns in project and non-project areas for most uses except in gardening and livestock.

### Table 9: Frequency of Water Supply Breakdowns, 2018

| Variable       | Mean | Total | Obs. | Mean | Total | Project | Obs. | Non-Project | Obs. | Diff. | T-Val. | P-Val. |
|----------------|------|-------|------|------|-------|---------|------|-------------|------|------|--------|--------|
| Drinking       | 2.068| 812   | 2.298| 490  | 1.717 | 322     | 1.717| 322         | 0.581| 1.295| 0.196  |
| Handwashing    | 1.473| 778   | 1.611| 457  | 1.277 | 321     | 1.277| 321         | 0.333| 0.731| 0.465  |
| Cooking        | 1.831| 793   | 1.925| 469  | 1.694 | 324     | 1.694| 324         | 0.231| 0.510| 0.610  |
| Toilet         | 1.053| 617   | 1.263| 334  | 0.806 | 283     | 0.806| 283         | 0.458| 0.818| 0.413  |
| Gardening      | 0.130| 461   | 0.217| 235  | 0.040 | 226     | 0.040| 226         | 0.177| 2.358| 0.019  |
| Other domestic uses | 1.084| 595   | 1.355| 321  | 0.766 | 274     | 0.766| 274         | 0.589| 1.014| 0.311  |
| Livestock      | 0.369| 488   | 0.482| 255  | 0.245 | 233     | 0.245| 233         | 0.238| 2.018| 0.044  |

Diff. = difference, Obs. = observed, P-Val = probability value, T-Val = T-value.

Source: Asian Development Bank.

### C.5 Use of Motorized Water Pump

37. About 6% of the respondents have a motorized water pump, and they spend an average of ₹315 per month, 58% of which is for pumping water and the rest for pump maintenance (Table 10).

38. Project areas have a smaller proportion of households with motorized water pump than non-project areas (4% vs. 8%). Similarly, the average monthly household expenditure for pumping water in project areas is significantly lower (₹142) compared to those in non-project areas (₹203). Only 112 out of 1,998 sample households who own a motorized water pump responded to the question of monthly expenditure on pump.
Table 10: Motorized Water Pump

| Variable                        | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Households with motorized water pump | 0.058      | 1,998      | 0.038        | 1,001        | 0.078            | 997              | -0.040 | -3.861 | 0.000  |
| Expenditure per month, pumping water   | 182.884    | 112        | 142.297      | 37           | 202.907          | 75               | -60.609 | -2.658 | 0.009  |
| Expenditure per month, pump maintenance | 131.682    | 110        | 112.571      | 35           | 140.600          | 75               | -28.029 | -1.456 | 0.148  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

C.6 Time Taken, Frequency, and Characteristics of Fetching Water

39. **Frequency.** Fetching of water ranges from two times a day for livestock, other domestic uses, and gardening to over four times a day for toilet use (Table 11). Comparing project and non-project areas, there is no significant difference except for handwashing and cooking. Focus group discussion with women respondents reveals that in water scarce villages, the number of trips to the water source is significantly greater—three to four times a day—as observed in Bankura and South 24 Parganas. In these villages, fetching water for toilet use causes additional burden and compels people, particularly men, to go out for toilet purposes (open defecation).11

11 Footnote 6, p. 10. Sigma Foundation 2019. *Gender Aspects in Accessing WASH Services: A Study in four Blocks of Bankura District of West Bengal.*
40. **Travel and waiting time.** In terms of travel time to the water source, water for drinking took the longest (a little over 6 minutes) closely followed by water for cooking (nearly 6 minutes); while water for livestock, other domestic uses, and toilet use took the shortest, about 3 minutes (Table 12). The waiting time at source is also the longest for drinking water (over 7 minutes) and shortest for livestock, other domestic uses, and toilet use (under 2 minutes). Comparing project and non-project areas, there are significant differences in travel times for water for toilet, gardening, and other domestic uses. Significant differences are also found for waiting time at source for water used for cooking, toilet, gardening, and other domestic uses.

### Table 11: Frequency of Fetching Water Per Day

| Variable          | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|-------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Drinking          | 2.712      | 1,606      | 2.668        | 737          | 2.749            | 869              | -0.082| -0.912 | 0.362  |
| Handwashing       | 2.845      | 1,243      | 3.002        | 550          | 2.720            | 693              | 0.282 | 2.438  | 0.015  |
| Cooking           | 2.464      | 1,503      | 2.351        | 643          | 2.548            | 860              | -0.196| -2.179 | 0.029  |
| Toilet            | 4.182      | 1,038      | 4.165        | 472          | 4.196            | 566              | -0.031| -0.229 | 0.819  |
| Gardening         | 1.907      | 43         | 1.333        | 21           | 2.455            | 22               | -1.121| -0.770 | 0.446  |
| Other domestic uses | 1.888     | 912        | 1.887        | 425          | 1.889            | 487              | -0.002| -0.014 | 0.989  |
| Livestock         | 1.881      | 294        | 2.053        | 133          | 1.739            | 161              | 0.314 | 1.317  | 0.189  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.

Source: Asian Development Bank.

### Table 12: Travel and Waiting Times at Source by Water Use

| Variable (minutes) | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Drinking           |            |            |              |              |                  |                  |       |        |        |
| Travel time to source | 6.362    | 1,373      | 6.257        | 607          | 6.445            | 766              | -0.188| -0.600 | 0.549  |
| Waiting time at source | 7.892    | 1,227      | 7.658        | 570          | 8.096            | 657              | -0.438| -1.043 | 0.297  |
| Handwashing        |            |            |              |              |                  |                  |       |        |        |
| Travel time to source | 4.324    | 1,005      | 4.238        | 442          | 4.393            | 563              | -0.155| -0.562 | 0.575  |
| Waiting time at source | 3.874    | 827        | 3.566        | 380          | 4.136            | 447              | -0.571| -1.518 | 0.129  |
| Cooking            |            |            |              |              |                  |                  |       |        |        |
| Travel time to source | 5.914    | 1,299      | 5.768        | 544          | 6.019            | 755              | -0.250| -0.841 | 0.401  |
| Waiting time at source | 7.338    | 1,150      | 6.737        | 513          | 7.823            | 637              | -1.086| -2.629 | 0.009  |
| Toilet             |            |            |              |              |                  |                  |       |        |        |
| Travel time to source | 2.880    | 749        | 2.419        | 360          | 3.306            | 389              | -0.886| -2.847 | 0.005  |
| Waiting time at source | 1.993    | 613        | 1.436        | 291          | 2.497            | 322              | -1.060| -3.065 | 0.002  |

*continued on next page*
### Table 12 continued

| Variable (minutes)          | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|----------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| **Gardening**              |            |            |              |              |                  |                  |       |        |        |
| Travel time to source      | 3.778      | 45         | 2.500        | 24           | 5.238            | 21               | -2.738| -1.968 | 0.055  |
| Waiting time at source     | 3.932      | 44         | 4.957        | 23           | 2.810            | 21               | 2.147 | 1.211  | 0.233  |
| **Other domestic uses**    |            |            |              |              |                  |                  |       |        |        |
| Travel time to source      | 2.727      | 648        | 2.354        | 333          | 3.121            | 315              | -0.766| -2.410 | 0.016  |
| Waiting time at source     | 1.982      | 545        | 1.341        | 287          | 2.694            | 258              | -1.352| -3.758 | 0.000  |
| **Livestock**              |            |            |              |              |                  |                  |       |        |        |
| Travel time to source      | 2.561      | 212        | 2.517        | 118          | 2.617            | 94               | -0.100| -0.160 | 0.873  |
| Waiting time at source     | 1.617      | 193        | 1.909        | 110          | 1.229            | 83               | 0.680 | 1.063  | 0.289  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value. Source: Asian Development Bank.

41. **Characteristics of those who fetch water.** The survey team identified the household members who are tasked to fetch water for different uses (Table 13). About two to three persons in the household comprising 62% of all members are involved in fetching water. Among the household members, women take the lead role (33%) followed closely by men (29%). Household heads (15%), mostly the male heads (14%) and spouse of heads, particularly the female spouse (18%), form the majority of those fetching water. The children of the head equally share the responsibility (18%), and of them, the sons (13%) are more involved while the daughters (5%) follow. Among other members who take part in fetching water are sons-in-law (7%) and daughters-in-law (7%).

42. Contrary to common tradition observed in other rural areas, men also share the burden of fetching water in some areas. According to an interview with Panchayat heads (of some gram panchayats in blocks with predominantly Muslim population of North and South 24 Parganas), women typically do not go beyond their villages to fetch water, since boys can carry more buckets on a cycle from far away drinking water sources. Findings of a study in Bankura conclude that the burden of fetching water for domestic use falls on the shoulder of women and girls, with 66% of the total water collected by them. However, in water scarce villages, men also participate in fetching water from faraway water sources (footnote 11). When some water sources dry up in the summer months, all able bodied men and women of the family take part in collecting water or at least stand in the queue at water source.
Table 13: Characteristics of Household Members who Fetch Water

| Variable                           | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val  | P-Val |
|------------------------------------|------------|------------|--------------|--------------|-----------------|-----------------|-------|--------|-------|
| Number of members fetching water   | 2.577      | 2,013      | 2.461        | 1,008        | 2.694           | 1,005           | -0.232| -3.385 | 0.001 |
| Prop. of members fetching water    | 0.620      | 8,361      | 0.583        | 4,259        | 0.660           | 4,102           | -0.077| -7.313 | 0.000 |
| Prop. of male in household         | 0.291      | 8,361      | 0.278        | 4,259        | 0.305           | 4,102           | -0.027| -2.715 | 0.007 |
| Prop. of female in household       | 0.329      | 8,361      | 0.304        | 4,259        | 0.355           | 4,102           | -0.050| -4.911 | 0.000 |
| Prop. of household head            | 0.153      | 8,361      | 0.142        | 4,259        | 0.165           | 4,102           | -0.023| -2.979 | 0.003 |
| Prop. of male household head       | 0.140      | 8,361      | 0.130        | 4,259        | 0.150           | 4,102           | -0.020| -2.680 | 0.007 |
| Prop. of female household head     | 0.013      | 8,361      | 0.012        | 4,259        | 0.015           | 4,102           | -0.003| -1.250 | 0.211 |
| Prop. of spouse of head            | 0.187      | 8,361      | 0.168        | 4,259        | 0.206           | 4,102           | -0.038| -4.420 | 0.000 |
| Prop. of male spouse               | 0.003      | 8,361      | 0.003        | 4,259        | 0.004           | 4,102           | -0.001| -0.659 | 0.510 |
| Prop. of female household spouse   | 0.183      | 8,361      | 0.165        | 4,259        | 0.202           | 4,102           | -0.037| -4.352 | 0.000 |
| Prop. of child of head             | 0.180      | 8,361      | 0.174        | 4,259        | 0.187           | 4,102           | -0.013| -1.545 | 0.122 |
| Prop. of son of head               | 0.132      | 8,361      | 0.130        | 4,259        | 0.134           | 4,102           | -0.004| -0.605 | 0.545 |
| Prop. of daughter of head          | 0.048      | 8,361      | 0.044        | 4,259        | 0.052           | 4,102           | -0.009| -1.818 | 0.069 |
| Prop. of son-in-law                | 0.002      | 8,361      | 0.002        | 4,259        | 0.003           | 4,102           | -0.001| -0.771 | 0.441 |
| Prop. of daughter-in-law           | 0.068      | 8,361      | 0.067        | 4,259        | 0.070           | 4,102           | -0.003| -0.508 | 0.611 |
| Prop. of grandchild                | 0.019      | 8,361      | 0.017        | 4,259        | 0.020           | 4,102           | -0.003| -1.045 | 0.296 |
| Prop. of grandson                  | 0.010      | 8,361      | 0.009        | 4,259        | 0.012           | 4,102           | -0.003| -1.476 | 0.140 |
| Prop. of granddaughter             | 0.008      | 8,361      | 0.008        | 4,259        | 0.008           | 4,102           | 0.000 | 0.082  | 0.934 |
| Prop. of other members             | 0.011      | 8,361      | 0.013        | 4,259        | 0.010           | 4,102           | 0.003 | 1.477  | 0.140 |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

43. Other information on water outside the premises. The survey team asked about the main use of water if it is not available in the premises, how much does a household spend per month if they buy water, and whether they experience muscle pain from carrying water. The average distance from the water source is 0.75 kilometer (Table 14). Households spend, on average, ₹241 per month if they buy water. About 11% of households revealed that their members experience muscle strain from carrying water.

44. A comparison of project and non-project areas reveals that there is no significant difference in the distance to the source of water. There is, however, significant differences in the amount spent for buying water and the proportion of households who had a member experiencing muscle pain, with project areas spending more on buying water and having more households reporting muscle strain from carrying water.
Table 14: Other Information on Water Outside the Premises

| Variable                                      | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|-----------------------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Approximate distance from source (kilometer) | 0.753      | 396        | 0.760        | 120          | 0.750            | 276              | 0.010 | 0.066  | 0.947  |
| Amount spent to purchase water (per month)   | 241.569    | 102        | 309.206      | 63           | 132.308          | 39               | 176.899 | 3.260  | 0.002  |
| Experience muscle strain from carrying water | 0.115      | 1,717      | 0.181        | 790          | 0.059            | 927              | 0.122 | 8.009  | 0.000  |

Diff. = difference, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

C.7 Water Purification at Household Level

About 5% of the sample households treat their water to make it safe for drinking (Table 15). The most common method used is to let it stand and settle (51%); this is a common water treatment practice in rural Bengal where safe piped water supply is almost absent. It would be of interest to find any difference in water treatment practices in post-project implementation period. The other common methods are boiling (14%), the use of water filter (10%), and the use of electric purifier (5%). The water treatment facilities are acquired by the well-off families. There is no significant difference in the incidence of water treatment and the method of treating water between project and non-project areas.

Table 15: Water Treatment of Drinking Water

| Variable                | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|-------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Treat water             | 0.0521     | 1,766      | 0.057        | 826          | 0.048            | 940              | 0.009 | 0.852  | 0.395  |
| Method of treatment     |            |            |              |              |                  |                  |       |        |        |
| Boil                    | 0.1410     | 78         | 0.200        | 40           | 0.079            | 38               | 0.121 | 1.539  | 0.128  |
| Add bleach, chlorine    | 0.0256     | 78         | 0.000        | 40           | 0.053            | 38               | -0.053 | -1.471 | 0.145  |
| Strain through cloth    | 0.0128     | 78         | 0.025        | 40           | 0.000            | 38               | 0.025 | 0.974  | 0.333  |
| Use water filter        | 0.1026     | 78         | 0.100        | 40           | 0.105            | 38               | -0.005 | -0.076 | 0.940  |
| Use electric purifier   | 0.0513     | 78         | 0.075        | 40           | 0.026            | 38               | 0.049 | 0.968  | 0.336  |
| Let it stand and settle| 0.5128     | 78         | 0.575        | 40           | 0.447            | 38               | 0.128 | 1.122  | 0.265  |
| Other                   | 0.1538     | 78         | 0.025        | 40           | 0.289            | 38               | -0.264 | -3.433 | 0.001  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.
C.8 Storing Water

46. About 95% of the respondents store their water (Table 16). The most common method is storing water in containers (96%). Storage in roof tanks and in underground tanks are also practiced by a small proportion of households (3% and 0.4%, respectively). Comparing project and non-project areas shows that the proportion of storing water is significantly different, with project areas showing a higher percentage (97%) compared to non-project areas (94%). There is also significant difference in the method of storage, wherein, in project areas, storage in containers is more common and storage in roof tank is less prevalent.

### Table 16: Storing Water

| Variable          | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|-------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Store water       | 0.953      | 1,899      | 0.969        | 924          | 0.937            | 975              | 0.031 | 3.203  | 0.001  |
| Method of storage |            |            |              |              |                  |                  |       |        |        |
| In containers     | 0.962      | 1,804      | 0.987        | 891          | 0.939            | 913              | 0.048 | 5.377  | 0.000  |
| In roof tank      | 0.034      | 1,804      | 0.012        | 891          | 0.055            | 913              | -0.042| -5.015 | 0.000  |
| In underground    | 0.004      | 1,804      | 0.001        | 891          | 0.007            | 913              | -0.005| -1.862 | 0.063  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.

Source: Asian Development Bank.

C.9 Sanitation Facilities at Household Level

47. **Toilet facilities.** Around 94% of households have toilet facilities; and among those who have toilet facilities, 96% are for their own use (Table 17). The most common type of toilet facility is pit latrine (59%) followed by open pit (24%). About 6% do not have any toilet facility. The National Sample Survey reports that 83.7% of rural households in West Bengal have access to a latrine.\(^\text{12}\)

48. A comparison of project and non-project areas indicates a significant difference in the availability of toilet facilities, with project areas having a lower proportion of households that have toilet facilities (93% vs. 96%). There is no significant difference in the most common type of toilet facility (pit latrine). Significant differences are found with respect to open pit which is more prevalent in non-project areas than in project areas (27% vs. 20%). There is also a significant difference in the case of no toilet—more households in project areas reported as having no toilet compared to those in non-project areas (7% vs. 4%).

49. **Health habits after toilet use.** The most common habit is washing hands without soap (49%) followed by washing hands with soap or cleaning agent (36%). Other less popular habits include cleaning the toilet (8%), bathing (3%), and changing clothes (2%). The popularity of washing of hand without soap could be because of two reasons: (i) soap may be unaffordable for some families, and (ii) using soap will consume more water which might be scarce in some areas, such as in Bankura district. It will be significant

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\(^{12}\) Ministry of Statistics and Programme Implementation, National Statistical Office, Government of India. 2018. *Drinking Water, Sanitation, Hygiene and Housing Condition in India. Report No. 584. NSS 76th Round. July–December.* Statement 12.1. p. 99.
to compare health habits after use of toilets in the post-project implementation period. Comparing project and non-project villages indicate that there are no significant differences in habits after using the toilet.

50. **On-site wastewater disposal facilities.** Around 94% of the households are connected to an on-site sanitation system, while 6% of the households have no sanitation facility (Table 17). The most common wastewater disposal/treatment system among households is leach pit (72%), followed by a soak pit (12%). About 6% of the sample households are connected to an open drain and another 4% with underground drain. About 6% are not connected with any type of sanitation system. As of September 2018, the state has achieved 95% toilet coverage in its rural areas, however, 5% of the population still practices open defecation.  

51. Comparing project and non-project areas shows that there is no significant difference for underground drains and open drains but there is a significant difference in the use of soak pit, with project areas having lower proportion (10%) compared to non-project areas (14%). The use of leach pit in both project and non-project areas have similar proportion, 71% and 72%, respectively.

52. **Attendance to hygiene and sanitation sessions.** Around 28% of households have members who attended hygiene and sanitation sessions (Table 17). A comparison between project and non-project areas indicates that there is no significant difference in the proportion of households attending hygiene and sanitation sessions.

### Table 17: Sanitation Facility

| Variable                      | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|-------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| With toilet                   | 0.942      | 2,008      | 0.929        | 1,007        | 0.956            | 1,001            | -0.028| -2.648 | 0.008  |
| Toilet for own use            | 0.955      | 1,892      | 0.951        | 935          | 0.958            | 957              | -0.007| -0.772 | 0.440  |

*Type of toilet facility*

|                  | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Flush            | 0.097      | 2,008      | 0.111        | 1,007        | 0.083            | 1,001            | 0.028 | 2.143  | 0.032  |
| Pit latrine      | 0.586      | 2,008      | 0.589        | 1,007        | 0.583            | 1,001            | 0.005 | 0.248  | 0.804  |
| Open pit         | 0.236      | 2,008      | 0.201        | 1,007        | 0.272            | 1,001            | -0.071| -3.764 | 0.000  |
| Others           | 0.023      | 2,008      | 0.028        | 1,007        | 0.018            | 1,001            | 0.010 | 1.471  | 0.141  |
| No toilet        | 0.058      | 2,008      | 0.071        | 1,007        | 0.044            | 1,001            | 0.028 | 2.648  | 0.008  |

*Health habits on toilet use*

| Variable                              | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|---------------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Wash hand with soap/cleansing material | 0.365      | 1,810      | 0.425        | 881          | 0.308            | 929              | 0.117 | 5.189  | 0.000  |
| Wash hand without soap                | 0.493      | 1,810      | 0.434        | 881          | 0.549            | 929              | -0.115| -4.938 | 0.000  |
| Clean toilet                          | 0.076      | 1,810      | 0.075        | 881          | 0.078            | 929              | -0.003| -0.207 | 0.836  |
| Change clothes                        | 0.020      | 1,810      | 0.022        | 881          | 0.018            | 929              | 0.003 | 0.497  | 0.619  |
| Bathe                                 | 0.031      | 1,810      | 0.035        | 881          | 0.028            | 929              | 0.007 | 0.876  | 0.381  |
| Others                                | 0.015      | 1,810      | 0.010        | 881          | 0.019            | 929              | -0.009| -1.607 | 0.108  |
| Connected to sanitation system        | 0.944      | 1,757      | 0.912        | 825          | 0.973            | 932              | -0.062| -5.669 | 0.000  |

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13 Ministry of Drinking Water and Sanitation, Ministry of Housing and Urban Affairs, Government of West Bengal. 2018.
Table 17 continued

| Variable                                | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff.   | T-Val | P-Val |
|-----------------------------------------|------------|------------|--------------|--------------|-----------------|-----------------|---------|-------|-------|
| Type of sanitation system               |            |            |              |              |                 |                 |         |       |       |
| Underground drains                      | 0.042      | 1,757      | 0.047        | 825          | 0.038           | 932             | 0.010   | 1.012 | 0.312 |
| Open drains                             | 0.064      | 1,757      | 0.059        | 825          | 0.069           | 932             | -0.009  | -0.791| 0.429 |
| Soak pit                                | 0.121      | 1,757      | 0.096        | 825          | 0.144           | 932             | -0.048  | -3.084| 0.002 |
| Leach pita                              | 0.717      | 1,757      | 0.709        | 825          | 0.723           | 932             | -0.014  | -0.654| 0.514 |
| Not connected                           | 0.056      | 1,757      | 0.088        | 825          | 0.027           | 932             | 0.062   | 5.669 | 0.000 |
| Household member attend hygiene and sanitation sessions | **0.284** | **1,626** | **0.287**    | **762**      | **0.280**       | **864**         | **0.007**| **0.326**| **0.744** |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.

*a* Leach pits are used for containment of raw sludge. These are used in conjunction with low-flush or pour-flush toilets.

Source: Asian Development Bank.

![Women collecting water from government stand post at scheduled time slot (photo from ABAR Conseil Private Limited).](image)
C.10 Health Outcomes

53. **Diarrhea.** Diarrhea incidence is 1.7% for all ages and 2.3% for children under 5 years old in the last 4 weeks (Table 18). This is much lower than those reported in the 2015–2016 NFHS-4 of 5.9% for children under 5 years old, although the reference period in the latter is shorter—last 2 weeks. In terms of the number of episodes per day, diarrhea incidence is reported to be about six times for all ages and similarly for children under 5 years old. Of those who reported with diarrhea, 4% had blood on the stool, 65% experienced vomiting, 66% had fever, and 68% had abdominal pain. The leading presumed causes of the diarrhea are water (45%) and food poisoning (36%). The other causes have very much lower proportions. The average number of days off (i.e., unable to do regular activities) due to diarrhea was a little over 5 days. According to the national level health survey, the incidence of diarrhea in West Bengal is 2.3% of the population with only 167 deaths recorded in 2018. The focus group discussion held among the women respondents and the accredited social health activist workers in some *gram panchayats* of North 24 Parganas discloses that consumption of unhygienic food in social gatherings and fair grounds is one major cause of diarrhea among all age groups. However, that occurrence could not be captured in the timeline of last 4 weeks preceding the survey.

54. The project and non-project areas show similar characteristics among diarrhea afflicted persons and inability to do regular activities. However, project areas have higher diarrhea incidence for all ages (2.3%) compared to non-project areas (1.2%). For children under 5 years old, the incidence is 3.7% in project areas compared with 1% in non-project areas. In terms of the number of days of productive work, those with diarrhea were not able to do regular activities; the project areas have lower number of days lost (4.8 days) compared to non-project areas (6.6 days).

| Variable                        | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|---------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|-------|-------|
| Diarrhea incidence, all ages   | 0.017      | 8,344      | 0.023        | 4,258        | 0.012            | 4,086            | 0.011 | 3.927 | 0.000 |
| Diarrhea incidence, 0 to 5 years old | 0.023     | 565        | 0.037        | 273          | 0.010            | 292              | 0.026 | 2.092 | 0.037 |
| Diarrhea episodes per day, all ages | 5.712     | 146        | 5.439        | 98           | 6.271            | 48               | -0.032 | -1.524 | 0.130 |
| Diarrhea episodes per day, 0 to 5 years old | 5.538     | 13         | 5.700        | 10           | 5.000            | 3                | 0.700 | 0.479 | 0.641 |
| Diarrhea with blood, all ages   | 0.043      | 141        | 0.042        | 95           | 0.043            | 46               | -0.001 | -0.038 | 0.970 |
| Diarrhea with vomiting, all ages | 0.648      | 145        | 0.643        | 98           | 0.660            | 47               | -0.017 | -0.196 | 0.845 |
| Diarrhea with fever, all ages   | 0.658      | 146        | 0.643        | 98           | 0.688            | 48               | -0.045 | -0.531 | 0.596 |
| Diarrhea with abdominal pain, all ages | 0.685     | 143        | 0.670        | 97           | 0.717            | 46               | -0.047 | -0.565 | 0.573 |

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14 Central Bureau of Health Intelligence, Ministry of Health and Family Welfare, Government of India. 2019. *National Health Profile*. 14.

15 An accredited social health activist (ASHA) is a grassroot level health care provider in rural areas under the National Rural Health Mission.
Table 18 continued

| Variable                        | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|---------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Presumed main cause of diarrhea |            |            |              |              |                  |                  |       |        |        |
| Water                           | 0.455      | 101        | 0.459        | 74           | 0.444            | 27               | 0.015 | 0.133  | 0.895  |
| Food poisoning                  | 0.356      | 101        | 0.338        | 74           | 0.407            | 27               | -0.070| -0.641 | 0.523  |
| Person-to-person contact        | 0.020      | 101        | 0.014        | 74           | 0.037            | 27               | -0.024| -0.746 | 0.458  |
| Infection                       | 0.050      | 101        | 0.041        | 74           | 0.074            | 27               | -0.034| -0.682 | 0.497  |
| Bowel disorder                  | 0.040      | 101        | 0.054        | 74           | 0.000            | 27               | 0.054 | 1.230  | 0.222  |
| Others                          | 0.079      | 101        | 0.095        | 74           | 0.037            | 27               | 0.058 | 0.943  | 0.348  |
| No. of days off from regular activity due to diarrhea over the last month) | 5.407 | 145 | 4.804 | 97 | 6.625 | 48 | -1.821 | -2.440 | 0.016 |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

55. **Arsenic poisoning, fluorosis, and water-salinity-related diseases.** Other important water source-related health issues in the project area are arsenic poisoning, fluorosis, and water salinity-related diseases (e.g., high blood pressure). Survey data indicate that there is a considerable awareness of the problem (8%) and awareness of the link between water salinity and high blood pressure (7%); and that the incidence of affected persons is at 14% (Table 19). A caveat here is that the survey involves self-reporting and perception of the respondents rather than rigorous testing. Further inquiry reveals that 6% were diagnosed previously, but presently not under treatment. ADB has reported that the incidence of arsenic poisoning at the level of habitations for West Bengal is 8% (8,066/105,905).16 The National Health Profile 2019 shows that 73 habitations in Bankura district are fluoride-affected as of April 2018 (footnote 14). In May 2020, the reported incidence of arsenic and fluoride-affected population in selected reference blocks was 9.24%. The arsenic-affected population was 13.62% in the two project blocks of North and South 24 Parganas, while the fluoride-affected population was 0.54% in the two project blocks of Bankura (Indpur and Mejhia).17 Comparing the treatment and comparison areas shows that, significantly, more households in the treatment areas are aware of the arsenic poisoning and fluorosis (13% vs. 3%) and aware of the link between water salinity and high blood pressure (11% vs. 2%). The incidence of arsenic poisoning, fluorosis, and high blood pressure are significantly different between treatment and comparison households, except for those previously affected but presently not under treatment (13% vs. 6%).

56. This study also presents disaggregated values by district to shed more light on the differences between the treatment and comparison areas. It should be noted that one of the limitations of this study is that the number of observations may not be enough to provide reliable estimates. Higher awareness on arsenic poisoning, fluorosis, and water salinity-related health issues are found in North (and South) Parganas compared to the two other districts. The project areas have higher awareness level than the non-project areas: 22% vs. 4% in arsenic and/or fluoride related diseases and 16% vs. 1% in salinity linked to high blood pressure. In terms of the incidence of those currently and previously affected by

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16 ADB. 2018. Report and Recommendations of the President to the Board of Directors: Proposed Loan for the Government of India for the West Bengal Drinking Water Sector Improvement Project Arsenic and Fluoride in Drinking Water in West Bengal—Characteristics, Implications, and Mitigation. Manila.

17 PHED, Govt. of West Bengal, May 2020.
arsenic/fluoride contamination, higher values are found in Bankura (22%), while Purba Medinipur and the North (and South) 24 Parganas have experienced less incidence (7% and 8%, respectively). The incidence of arsenic or fluoride contamination is more visible in project blocks than in the non-project blocks.

57. The incidence of arsenic-affected persons is predominant in North and South 24 Parganas, while Bankura is affected mostly by the fluoride in water. The extent of arsenic and fluoride has been derived from the results of the water quality test by the PHED. In the two project blocks of North and South 24 Parganas district, the presence of total arsenic measures an average of 0.14 milligrams per liter (mg/l), while the seven blocks of both project and non-project category in Bankura show an average fluoride content of 17.95 mg/l.\textsuperscript{18} There is no data recorded on either total arsenic or fluoride content in water in Purba Medinipur in 2019.

58. Findings of the focus group discussion held in North 24 Parganas suggest the complexity of water use in arsenic prone areas. People in some of the gram panchayats, women particularly, have confessed that although they are aware of the consequences of using water from contaminated tube well/handpump in their locality, they have no other choice but to use it since the safe water sources are far away. While water from these tube wells/handpumps is used for household chores like washing and cleaning, safe water from a distant source is drawn by men for drinking and cooking only. The gram panchayats, however, claim that all known contaminated sources of water are immediately sealed off once the water is tested and found to contain arsenic or fluoride above the permissive level.

59. Comparing treatment and comparison groups in terms of awareness on arsenic poisoning and fluorosis, North (and South) 24 Parganas show higher awareness among the treatment households relative to comparison households. All the three districts show that the treatment households compared to the comparison households have significantly higher awareness of the relationship between water salinity and high blood pressure. In terms of disease incidence, treatment households compared to comparison households have significantly higher cases in all the districts. In Bankura, it is 30% vs. 13%, while Purba Medinipur recorded 9% vs. 5%. In North (and South) 24 Parganas, the disease incidence in treatment households compared to comparison households is 13% vs. 3%. In comparing incidence of diseases, only those presently diagnosed and/or under treatment were considered.

\textbf{C.11 Education Outcomes}

\textbf{C.11.1 School attendance}

60. School attendance for 6 to 17 years old is 90% (Table 20), 5% higher than what is reported in the 2015–2016 NFHS-4 of 85%. Attendance rate is highest for the youngest age group 6–10 years old (98%), followed by age group 11–14 years old (96%); and it is lowest for age group 15–17 years old (75%). The t-test shows that the attendance rates are nearly identical between project and non-project areas.

\textsuperscript{18} The affected gram panchayats are Haroa, Gopalpur I & II, Borjuri, Salipur, Sonapukur-Sankarpur, Kulti of Haroa Block, North 24 Parganas; Benota I & II of Bhangar II block, South 24 Parganas; and Indpur, Fulмотi, Lachmanpūr, Ramchandra, Čaprapur, Purba Nabasan, Gelia, Deshakolpara of Indpur, Taldangra, Gangajalghati, Mejhoria, Sonamukhi, Jaypur & Kotulpur Blocks, Bankura district. See Public Health Engineering Department, Government of West Bengal. Major Water Supply Projects. www.wbphed.gov.in (accessed December 2019).
Table 19: Awareness and Incidence of Arsenic Poisoning, Fluorosis, and Water Salinity-Related Diseases

| Variable                                                                 | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------------------------------------------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Aware of arsenic poisoning, fluorosis                                    | 0.083      | 2,013      | 0.132        | 1,008        | 0.034            | 1,005            | 0.098 | 8.105  | 0.000  |
| Aware that drinking water salinity is linked to high blood pressure     | 0.066      | 2,013      | 0.113        | 1,008        | 0.019            | 1,005            | 0.094 | 8.659  | 0.000  |
| Member currently diagnosed with arsenic poisoning, fluorosis or high blood pressure | 0.038      | 2,013      | 0.043        | 1,008        | 0.033            | 1,005            | 0.010 | 1.156  | 0.248  |
| Member previously affected but presently not under treatment           | 0.059      | 2,013      | 0.094        | 1,008        | 0.024            | 1,005            | 0.070 | 6.766  | 0.000  |
| Member currently diagnosed or previously affected but not under treatment | 0.097      | 2,013      | 0.137        | 1,008        | 0.057            | 1,005            | 0.080 | 6.135  | 0.000  |
| Bankura                                                                  |            |            |              |              |                  |                  |       |        |        |
| Aware of arsenic poisoning, fluorosis                                    | 0.056      | 305        | 0.053        | 150          | 0.058            | 155              | –0.005 | 0.179  | 0.858  |
| Aware that drinking water salinity is linked to high blood pressure     | 0.056      | 305        | 0.100        | 150          | 0.013            | 155              | 0.087 | 3.365  | 0.001  |
| Member currently diagnosed with arsenic poisoning, fluorosis or high blood pressure | 0.046      | 305        | 0.013        | 150          | 0.077            | 155              | –0.064 | –2.697 | 0.007  |
| Member previously affected but presently not under treatment           | 0.170      | 305        | 0.287        | 150          | 0.058            | 155              | 0.229 | 5.553  | 0.000  |
| Member currently diagnosed or previously affected but not under treatment | 0.216      | 305        | 0.300        | 150          | 0.135            | 155              | 0.165 | 3.548  | 0.000  |
| Purba Medinipur                                                         |            |            |              |              |                  |                  |       |        |        |
| Aware of arsenic poisoning, fluorosis                                    | 0.047      | 846        | 0.074        | 420          | 0.021            | 426              | 0.053 | 3.634  | 0.000  |
| Aware that drinking water salinity is linked to high blood pressure     | 0.048      | 846        | 0.071        | 420          | 0.026            | 426              | 0.046 | 3.102  | 0.002  |
| Member currently diagnosed with arsenic poisoning, fluorosis or high blood pressure | 0.057      | 846        | 0.076        | 420          | 0.038            | 426              | 0.039 | 2.434  | 0.015  |
| Member previously affected but presently not under treatment           | 0.013      | 846        | 0.010        | 420          | 0.016            | 426              | –0.007 | –0.886 | 0.376  |
| Member currently diagnosed or previously affected but not under treatment | 0.070      | 846        | 0.086        | 420          | 0.054            | 426              | 0.032 | 1.813  | 0.070  |
| North (and South) 24 Parganas                                            |            |            |              |              |                  |                  |       |        |        |
| Aware of arsenic poisoning, fluorosis                                    | 0.128      | 862        | 0.215        | 438          | 0.038            | 424              | 0.177 | 8.060  | 0.000  |
| Aware that drinking water salinity is linked to high blood pressure     | 0.087      | 862        | 0.158        | 438          | 0.014            | 424              | 0.143 | 7.712  | 0.000  |
| Member currently diagnosed with arsenic poisoning, fluorosis or high blood pressure | 0.016      | 862        | 0.021        | 438          | 0.012            | 424              | 0.009 | 1.016  | 0.310  |
| Member previously affected but presently not under treatment           | 0.065      | 862        | 0.110        | 438          | 0.019            | 424              | 0.091 | 5.490  | 0.000  |
| Member currently diagnosed or previously affected but not under treatment | 0.081      | 862        | 0.130        | 438          | 0.031            | 424              | 0.099 | 5.430  | 0.000  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.

61. Disaggregating school attendance by sex shows a higher attendance rate for females compared to males. For instance, for school age 6–17 years old, the attendance rate of females is 94% compared to 87% for males. Similar high attendance rates for females compared to males are reflected with age-disaggregated subpopulations. Again, there is no significant difference in sex-disaggregated attendance rates between project and non-project areas.
Table 20: Attendance Rates

| Variable (School Attendance) | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|------------------------------|------------|------------|--------------|--------------|-----------------|-----------------|-------|--------|--------|
| Total                        |            |            |              |              |                 |                 |       |        |        |
| 6–17 years old               | 0.904      | 1,462      | 0.897        | 745          | 0.911           | 717             | -0.014| -0.912 | 0.362  |
| 6–10 years old               | 0.979      | 529        | 0.975        | 277          | 0.984           | 252             | -0.009| -0.756 | 0.450  |
| 11–14 years old              | 0.955      | 508        | 0.941        | 254          | 0.969           | 254             | -0.028| -1.494 | 0.136  |
| 15–17 years old              | 0.748      | 425        | 0.743        | 214          | 0.754           | 211             | -0.011| -0.250 | 0.802  |
| Male                         |            |            |              |              |                 |                 |       |        |        |
| 6–17 years old               | 0.873      | 803        | 0.859        | 404          | 0.887           | 399             | -0.028| -1.204 | 0.229  |
| 6–10 years old               | 0.972      | 287        | 0.960        | 150          | 0.985           | 137             | -0.025| -1.305 | 0.193  |
| 11–14 years old              | 0.927      | 287        | 0.905        | 137          | 0.947           | 150             | -0.042| -1.350 | 0.178  |
| 15–17 years old              | 0.681      | 229        | 0.675        | 117          | 0.688           | 112             | -0.012| -0.199 | 0.843  |
| Female                       |            |            |              |              |                 |                 |       |        |        |
| 6–17 years old               | 0.941      | 659        | 0.941        | 341          | 0.940           | 318             | 0.001 | 0.060  | 0.953  |
| 6–10 years old               | 0.988      | 242        | 0.992        | 127          | 0.983           | 115             | 0.010 | 0.666  | 0.506  |
| 11–14 years old              | 0.991      | 221        | 0.983        | 117          | 1.000           | 104             | -0.017| -1.339 | 0.182  |
| 15–17 years old              | 0.827      | 196        | 0.825        | 97           | 0.828           | 99              | -0.004| -0.065 | 0.948  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value. Source: Asian Development Bank.

C.11.2 Absences

62. The incidence of absences is about 11% with project areas showing significantly higher incidence rates compared to non-project areas (14% vs. 7%) (Table 21). In terms of the number of days of absence in a month, survey result indicates an average of less than half a day. Again, the number of days is higher in project areas compared to non-project areas. Disaggregation by sex does not seem to show differences in incidence between males and females. However, in terms of the number of days, females have a slightly higher average number of days absent than males.

C.12 Work and Income

C.12.1 Housework

63. In terms of the number of hours that family members spend on household work for the past week, on average, each member spends 19 hours per week on housework. Women spend their time in housework almost five times more compared to men (33 hours vs. 7 hours) (Table 22).
Table 21: School Absences, Days in a Month

| Variable                   | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|---------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| **Total: Absence incidence** |            |            |              |              |                  |                  |       |        |        |
| 6–17 years old            | 0.107      | 1,321      | 0.142        | 668          | 0.072            | 653              | 0.070 | 4.144  | 0.000  |
| 6–10 years old            | 0.104      | 518        | 0.144        | 270          | 0.060            | 248              | 0.084 | 3.148  | 0.002  |
| 11–14 years old           | 0.111      | 485        | 0.142        | 239          | 0.081            | 246              | 0.061 | 2.139  | 0.033  |
| 15–17 years old           | 0.107      | 318        | 0.138        | 159          | 0.075            | 159              | 0.063 | 1.818  | 0.070  |
| **Total: Absent days over the past month** |            |            |              |              |                  |                  |       |        |        |
| 6–17 years old            | 0.416      | 1,313      | 0.585        | 665          | 0.242            | 648              | 0.343 | 3.833  | 0.000  |
| 6–11 years old            | 0.388      | 515        | 0.569        | 269          | 0.191            | 246              | 0.378 | 2.603  | 0.010  |
| 11–14 years old           | 0.434      | 482        | 0.609        | 238          | 0.262            | 244              | 0.347 | 2.456  | 0.014  |
| 15–17 years old           | 0.434      | 316        | 0.576        | 158          | 0.291            | 158              | 0.285 | 1.499  | 0.135  |
| **Male absence incidence** |            |            |              |              |                  |                  |       |        |        |
| 6–17 years old            | 0.110      | 701        | 0.147        | 347          | 0.073            | 354              | 0.074 | 3.130  | 0.002  |
| 6–10 years old            | 0.097      | 279        | 0.125        | 144          | 0.067            | 135              | 0.058 | 1.649  | 0.100  |
| 11–14 years old           | 0.109      | 266        | 0.145        | 124          | 0.077            | 142              | 0.068 | 1.771  | 0.078  |
| 15 to 17 years old        | 0.135      | 156        | 0.190        | 79           | 0.078            | 77               | 0.112 | 2.063  | 0.041  |
| **Male: Absent days over the past month** |            |            |              |              |                  |                  |       |        |        |
| 6–17 years old            | 0.372      | 696        | 0.539        | 345          | 0.208            | 351              | 0.331 | 3.190  | 0.001  |
| 6–11 years old            | 0.324      | 278        | 0.424        | 144          | 0.216            | 134              | 0.207 | 1.393  | 0.165  |
| 11–14 years old           | 0.379      | 264        | 0.577        | 123          | 0.206            | 141              | 0.372 | 2.209  | 0.028  |
| 15–17 years old           | 0.448      | 154        | 0.692        | 78           | 0.197            | 76               | 0.495 | 1.925  | 0.056  |
| **Female absence incidence** |            |            |              |              |                  |                  |       |        |        |
| 6–17 years old            | 0.105      | 620        | 0.137        | 321          | 0.070            | 299              | 0.067 | 2.726  | 0.007  |
| 6–10 years old            | 0.113      | 239        | 0.167        | 126          | 0.053            | 113              | 0.114 | 2.803  | 0.005  |
| 11–14 years old           | 0.114      | 219        | 0.139        | 115          | 0.087            | 104              | 0.053 | 1.221  | 0.224  |
| 15–17 years old           | 0.080      | 162        | 0.088        | 80           | 0.073            | 82               | 0.014 | 0.334  | 0.739  |
| **Female: Absent days over the past month** |            |            |              |              |                  |                  |       |        |        |
| 6–17 years old            | 0.465      | 617        | 0.634        | 320          | 0.283            | 297              | 0.352 | 2.342  | 0.019  |
| 6–11 years old            | 0.464      | 237        | 0.736        | 125          | 0.161            | 112              | 0.575 | 2.191  | 0.029  |
| 11–14 years old           | 0.500      | 218        | 0.643        | 115          | 0.340            | 103              | 0.304 | 1.275  | 0.204  |
| 15–17 years old           | 0.420      | 162        | 0.463        | 80           | 0.378            | 82               | 0.084 | 0.302  | 0.763  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.
Source: Asian Development Bank.
64. In terms of the type of housework, the biggest shares are in house cleaning, laundry, dishwashing, and cooking (37%). This is closely followed by marketing (29%) and fetching water (21%). For female members, cleaning the house, laundry, dishwashing, and cooking constitute the bulk of housework (67%). For male members, marketing (56%) accounts for the largest share of housework. Fetching water comes next for both male and female, although males spend more time on it (24% vs. 19%).

65. There is a significant difference in the number of hours spent in housework between men in project areas and those in non-project areas. Males in project areas spend one more hour in household work compared to those in non-project areas (7 hours vs. 6 hours). There is also a significant difference in the shares by types of housework between project and non-project areas. For both male and female members of families, the share in making mats, knitting, weaving, and tailoring is higher in project areas than in non-project areas (0.8% vs 0.2%). The same is true with caring for the elderly/sick/disabled and babysitting (3% vs. 2%). In marketing, the opposite happens with project areas having a lower share compared to non-project areas (28% vs. 30%).

### Table 22: Housework and Community Work, Past Week

| Variable                                         | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------------------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Housework, both, total hours                    | 19.072     | 7,905      | 18.875       | 4,043        | 19.279           | 3,862            | -0.405| -0.788 | 0.430  |
| Housework, male, total hours                     | 6.711      | 4,242      | 7.156        | 2,197        | 6.233            | 2,045            | 0.923 | 2.864  | 0.004  |
| Housework, female, total hours                   | 33.388     | 3,663      | 32.822       | 1,846        | 33.963           | 1,817            | -1.141| -1.395 | 0.163  |

**Share, All**

| Variable                                         | Mean | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------------------------------------------|------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Collecting firewood/fodder/grass, care of animals | 0.092| 5,731      | 0.092        | 2,788        | 0.092            | 2,943            | 0.001 | 0.172  | 0.864  |
| Fetching water                                   | 0.214| 5,727      | 0.215        | 2,788        | 0.212            | 2,939            | 0.003 | 0.462  | 0.644  |
| Making mats, knitting, weaving, tailoring        | 0.005| 5,723      | 0.008        | 2,788        | 0.002            | 2,935            | 0.005 | 4.461  | 0.000  |
| Processing preserved food/snacks                 | 0.004| 5,723      | 0.004        | 2,788        | 0.004            | 2,935            | 0.000 | 0.205  | 0.838  |
| Caring for the elderly/sick/disabled and babysitting | 0.022| 5,722      | 0.026        | 2,788        | 0.018            | 2,934            | 0.009 | 3.274  | 0.001  |
| Cleaning house, laundry, dishwashing, cooking    | 0.370| 5,723      | 0.372        | 2,788        | 0.369            | 2,935            | 0.003 | 0.318  | 0.750  |
| Marketing                                        | 0.289| 5,728      | 0.277        | 2,788        | 0.300            | 2,940            | -0.023| -2.415 | 0.016  |
| Other volunteer work, SHG, community activities  | 0.005| 5,723      | 0.005        | 2,788        | 0.005            | 2,935            | 0.000 | 0.383  | 0.702  |

**Share, Male**

| Variable                                         | Mean | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|--------------------------------------------------|------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Collecting firewood/fodder/grass, care of animals | 0.125| 2,844      | 0.118        | 1,350        | 0.130            | 1,494            | -0.012| -1.624 | 0.104  |
| Fetching water                                   | 0.237| 2,841      | 0.242        | 1,350        | 0.234            | 1,491            | 0.008 | 0.755  | 0.450  |

continued on next page
### Table 22 continued

| Variable                                      | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff.       | T-Val. | P-Val. |
|-----------------------------------------------|------------|------------|--------------|--------------|------------------|------------------|------------|--------|--------|
| Making mats, knitting, weaving, tailoring     | 0.003      | 2,840      | 0.003        | 1,350        | 0.002            | 1,490            | 0.002      | 0.965  | 0.334  |
| Processing preserved food/snacks              | 0.000      | 2,839      | 0.000        | 1,350        | 0.001            | 1,489            | -0.001     | -2.300 | 0.022  |
| Caring for the elderly/sick/disabled and babysitting | 0.009   | 2,839      | 0.012        | 1,350        | 0.006            | 1,489            | 0.006      | 2.105  | 0.035  |
| Cleaning house, laundry, dishes, cooking      | 0.068      | 2,837      | 0.073        | 1,350        | 0.064            | 1,487            | 0.009      | 1.259  | 0.208  |
| Marketing                                     | 0.556      | 2,843      | 0.547        | 1,350        | 0.564            | 1,493            | -0.016     | -1.280 | 0.201  |
| Other volunteer work, SHG, community activities | 0.003   | 2,839      | 0.005        | 1,350        | 0.001            | 1,489            | 0.004      | 2.638  | 0.008  |

#### Share, Female

| Collecting firewood/fodder/grass, care of animals | 0.060 | 2,887 | 0.069 | 1,438 | 0.052 | 1,449 | 0.017 | 4.047 | 0.000 |
| Fetching water                                   | 0.190 | 2,886 | 0.191 | 1,438 | 0.190 | 1,448 | 0.000 | 0.042 | 0.966 |
| Making mats, knitting, weaving, tailoring        | 0.007 | 2,883 | 0.012 | 1,438 | 0.003 | 1,445 | 0.009 | 5.036 | 0.000 |
| Processing preserved food/snacks                 | 0.008 | 2,884 | 0.008 | 1,438 | 0.007 | 1,446 | 0.001 | 0.421 | 0.674 |
| Caring for the elderly/sick/disabled and babysitting | 0.034 | 2,883 | 0.039 | 1,438 | 0.029 | 1,445 | 0.010 | 2.315 | 0.021 |
| Cleaning house, laundry, dishwashing, cooking    | 0.668 | 2,886 | 0.653 | 1,438 | 0.682 | 1,448 | -0.029 | -3.019 | 0.003 |
| Marketing                                        | 0.026 | 2,885 | 0.024 | 1,438 | 0.029 | 1,447 | -0.005 | -1.388 | 0.165 |
| Other volunteer work, SHG, community activities | 0.007 | 2,884 | 0.005 | 1,438 | 0.009 | 1,446 | -0.004 | -2.049 | 0.041 |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, SHG = self-help group, T-Val = T-value.

Source: Asian Development Bank.

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**C.12.2 Economically productive work**

66. In terms of productive work, only 38% are engaged in paid work for both sexes (Table 23). The proportion employed is more than 10 times higher for males (65%) compared to females (6%). In terms of hours spent on market work, males spend 46 hours while females spend 40 hours if they do market work.

67. The work distribution across sectors shows that non-agriculture has the biggest share (33%) followed by agriculture (24%), own business (17%), and private sector employment (14%). In terms of the nature of employment, being a paid employee accounts for the biggest share (54%). Having own business/farm with employees follows next (35%). Having own business/farm without employees and family without pay account for only 3% and 1%, respectively. In terms of the nature of payment, the daily wage earners constitute 61% of the workers; followed by those that are paid long-term and paid monthly (19% and 18%, respectively). The daily average cash payment is ₹338, with males being paid higher than females (₹345 vs. ₹251).
68. There is no significant difference between the project and non-project areas in the proportion employed and the number of work hours per week. The significant difference occurs in the sector distribution for most sectors, the nature of employment, and the nature of payment.

C.12.3 Productive work income

69. On average, more than two household members earning a labor income has an average income of ₹12,909 per month (Table 23). There is no significant difference in the number of members with labor income and in the total household labor income between project and non-project areas.

| Variable                          | Mean      | Obs.     | Mean     | Obs.     | Mean       | Obs.       | Diff. | T-Val. | P-Val. |
|-----------------------------------|-----------|----------|----------|----------|------------|------------|-------|--------|--------|
|                                   | Total     | Project  | Project  | Non-Project | Project    | Non-Project |       |        |        |
| Proportion employed, both         | 0.381     | 7,770    | 0.383    | 3,944     | 0.380      | 3,826       | 0.003 | 0.281  | 0.779  |
| Proportion employed, male         | 0.653     | 4,197    | 0.646    | 2,162     | 0.660      | 2,035       | -0.014| -0.971 | 0.331  |
| Proportion employed, female       | 0.062     | 3,573    | 0.063    | 1,782     | 0.060      | 1,791       | 0.003 | 0.317  | 0.751  |
| Number of hours per week          | 45.440    | 2,960    | 45.047   | 1,509     | 45.848     | 1,451       | -0.801| -1.546 | 0.122  |
| Number of hours per week, male    | 45.912    | 2,740    | 45.475   | 1,397     | 46.366     | 1,343       | -0.891| -1.677 | 0.094  |
| Number of hours per week, female  | 39.559    | 220      | 39.705   | 112       | 39.407     | 108         | 0.298 | 0.145  | 0.885  |
| Sector of employment              |           |          |          |           |            |             |       |        |        |
| Agriculture                       | 0.239     | 2,961    | 0.236    | 1,509     | 0.243      | 1,452       | -0.007| -0.459 | 0.647  |
| Allied agriculture                | 0.025     | 2,961    | 0.032    | 1,509     | 0.018      | 1,452       | 0.014 | 2.424  | 0.015  |
| Household industry                | 0.011     | 2,961    | 0.013    | 1,509     | 0.010      | 1,452       | 0.003 | 0.764  | 0.445  |
| Non-agriculture                   | 0.330     | 2,961    | 0.302    | 1,509     | 0.359      | 1,452       | -0.057| -3.320 | 0.001  |
| Family business                   | 0.018     | 2,961    | 0.025    | 1,509     | 0.010      | 1,452       | 0.016 | 3.223  | 0.001  |
| Own business                      | 0.172     | 2,961    | 0.186    | 1,509     | 0.158      | 1,452       | 0.029 | 2.054  | 0.040  |
| Private sector employment         | 0.141     | 2,961    | 0.129    | 1,509     | 0.154      | 1,452       | -0.026| -2.009 | 0.045  |
| Public sector employment          | 0.037     | 2,961    | 0.048    | 1,509     | 0.027      | 1,452       | 0.021 | 2.990  | 0.003  |
| Others                            | 0.026     | 2,961    | 0.030    | 1,509     | 0.021      | 1,452       | 0.010 | 1.690  | 0.091  |
| Nature of employment              |           |          |          |           |            |             |       |        |        |
| Paid employee                     | 0.539     | 2,961    | 0.533    | 1,509     | 0.544      | 1,452       | -0.011| -0.579 | 0.563  |
| Own business/farm without employees| 0.032   | 2,961    | 0.050    | 1,509     | 0.013      | 1,452       | 0.037 | 5.711  | 0.000  |
| Own business/farm with employees  | 0.351     | 2,961    | 0.326    | 1,509     | 0.376      | 1,452       | -0.050| -2.853 | 0.004  |
| Family without pay                | 0.011     | 2,961    | 0.013    | 1,509     | 0.010      | 1,452       | 0.003 | 0.764  | 0.445  |
| Nature of payment                 |           |          |          |           |            |             |       |        |        |
| Daily                             | 0.608     | 2,961    | 0.564    | 1,509     | 0.653      | 1,452       | -0.089| -4.974 | 0.000  |
| Long-term                         | 0.192     | 2,961    | 0.206    | 1,509     | 0.178      | 1,452       | 0.028 | 1.962  | 0.050  |

continued on next page
### Table 23 continued

| Variable                                           | Mean Total | Obs. Total | Mean Project | Obs. Project | Mean Non-Project | Obs. Non-Project | Diff. | T-Val. | P-Val. |
|----------------------------------------------------|------------|------------|--------------|--------------|------------------|------------------|-------|--------|--------|
| Contract                                           | 0.014      | 2,961      | 0.015        | 1,509        | 0.013            | 1,452            | 0.002 | 0.496  | 0.620  |
| Monthly                                            | 0.180      | 2,961      | 0.206        | 1,509        | 0.152            | 1,452            | 0.054 | 3.827  | 0.000  |
| Unpaid                                             | 0.006      | 2,961      | 0.008        | 1,509        | 0.004            | 1,452            | 0.004 | 1.337  | 0.181  |
| Cash payment, both, daily average (₹)              | 338.340    | 2,960      | 333.071      | 1,509        | 343.819          | 1,451            | -10.748 | -1.662 | 0.097  |
| Cash payment, male, daily equivalent (₹)           | 345.337    | 2,740      | 338.753      | 1,397        | 352.186          | 1,343            | -13.433 | -1.991 | 0.047  |
| Cash payment, female, daily equivalent (₹)         | 251.186    | 220        | 262.196      | 112          | 239.769          | 108              | 22.428  | 1.194  | 0.234  |
| Number of members with labor income (₹)            | 2.382      | 2,013      | 2.428        | 1008         | 2.335            | 1,005            | 0.092  | 1.364  | 0.173  |
| Total household labor income, monthly (₹)          | 12,908.746 | 2,013      | 12,921.940   | 1008         | 12,895.512       | 1,005            | 26.428 | 0.064  | 0.949  |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value.

Source: Asian Development Bank.

### C.13 Household Expenditures

70. Households spend an average of ₹8,233 per month (Table 24). Food accounts for 54% while non-food items account for 46% of the expenditures. Both education and health each constitute 6% of monthly expenditures, while water accounts for only 0.4%. Six percent of health expenditure accounts for about ₹494 per month for the household, which seems to be low. In this context, the average per capita health expenditure for the state of West Bengal may be compared which is ₹778 as a share of the state’s total health expenditure of ₹7,239, in 2014–2015. The very low health expenditure incurred by sample households can also be explained by the health care scheme undertaken by West Bengal’s Department of Health and Family Welfare. Since October 2014, when the scheme was effected, the government of West Bengal has withdrawn all user charges for diagnostic, therapeutic, surgery, and bed services in all secondary and primary hospitals of the state, and access to health care facilities becomes affordable at a minimal cost (Government Order provided in Appendix 4).

The average monthly expenditure on water for all households is 0.4% which is ₹33 a month. This should not be confused, for instance, with the average expenditure on pumping water (₹314 a month, in Table 10) which refers only to 112 reporting households who pump water.

71. A comparison of projects and non-project areas shows a significant difference in total expenditures, with households in project areas having higher expenditures. The share of food expenditure in project areas, on the other hand, is significantly lower compared to those in non-project areas (52% vs. 56%) and non-food expenditure share is more in project areas compared to non-project areas (48% vs. 44%). Significant differences are also found in most expenditure shares except for education, entertainment, and house rent.

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19 Ministry of Health & Family Welfare, Government of India. 2019. *National Health Profile 2019*. (Table 4.1.5: Expenditure on Health: Per Capita, as Share of Total Expenditure and as Share of GSDP for all State & Union Territories, 2015–2016).

20 Department of Health and Family Welfare. Government of West Bengal. 2014. Order No. HF/O/MS/984/W-10/2001. Kolkata. 22 October.
72. The difference in household spending between project and non-project areas may be explained by the socioeconomic characteristics of the sample households. The general (non-minority) class constituting 44% of the sample (Table 4) and indicating significant difference between treatment and comparison households also shows significantly higher total household expenditure (₹9,431 vs. ₹7,257). The scheduled caste group also showed statistically significant difference between treatment and comparison households (Table 4). But this group did not show statistically significant difference in expenditures, counteracting the hypothesis that the difference in socioeconomic characteristics explains the differences in expenditures.

| Variable                              | Mean          | Mean          | Mean          | Mean          | Mean          | Mean          | Diff.     | T-Val. | P-Val. |
|---------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|-----------|--------|--------|
| Total expenditure, monthly            | 8,233.29      | 8,854.02      | 7,610.08      | 8,854.02      | 7,610.08      | 1,243.93      | 2.794     | 0.005  |        |
| Share                                 |               |               |               |               |               |               |           |        |        |
| Food                                  | 0.539         | 0.520         | 0.557         | 0.520         | 0.557         | 0.036         | -5.552    | 0.000  |        |
| Non-food                               | 0.461         | 0.480         | 0.443         | 0.480         | 0.443         | 0.036         | 5.552     | 0.000  |        |
| Education                              | 0.055         | 0.055         | 0.055         | 0.055         | 0.055         | 0.000         | 0.142     | 0.887  |        |
| Health                                 | 0.056         | 0.065         | 0.047         | 0.065         | 0.047         | 0.018         | 5.053     | 0.000  |        |
| Water                                  | 0.004         | 0.003         | 0.005         | 0.003         | 0.005         | 0.001         | -1.592    | 0.111  |        |
| Beverage and tobacco                   | 0.015         | 0.013         | 0.017         | 0.013         | 0.017         | 0.004         | -4.244    | 0.000  |        |
| Clothing                               | 0.080         | 0.087         | 0.073         | 0.087         | 0.073         | 0.013         | 4.673     | 0.000  |        |
| Fuel and light                         | 0.050         | 0.047         | 0.053         | 0.047         | 0.053         | 0.006         | -3.817    | 0.000  |        |
| Transportation and communication      | 0.070         | 0.066         | 0.073         | 0.066         | 0.073         | 0.006         | -2.823    | 0.005  |        |
| Entertainment                          | 0.015         | 0.014         | 0.016         | 0.014         | 0.016         | 0.002         | -2.448    | 0.014  |        |
| Housing repairs                        | 0.018         | 0.025         | 0.010         | 0.025         | 0.010         | 0.014         | 3.952     | 0.000  |        |
| House rent                             | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 0.000         | 1.411     | 0.158  |        |
| Others                                 | 0.099         | 0.104         | 0.095         | 0.104         | 0.095         | 0.009         | 2.799     | 0.005  |        |

Diff. = difference, Educ. = education, Obs. = observed, P-Val = probability value, T-Val = T-value. Source: Asian Development Bank.

IV.  OVERALL RESULTS SUMMARY

73. The baseline survey covered 2,013 households from randomly selected 28 project gram panchayats and 29 non-project gram panchayats in three project districts: Bankura, Purba Medinipur, and North (and South) 24 Parganas. The survey covers the primary indicators for establishing the project impact at the household level. Project gram panchayats were randomly selected from the list of gram panchayats where the project will be implemented. The non-project gram panchayats were selected based on matching at two levels: block and gram panchayats. The matching used characteristics

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21 One neighboring block in South 24 Parganas was also included in North 24 Parganas drinking water scheme based on need and economy of scale.
such as number of households, total land area, number of gram panchayats (only at the block level), population density, proportion of area irrigated, proportion of the population in scheduled caste, proportion of the population in scheduled tribe, proportion of illiterate population, proportion of working population, and proportion of the households with tap water.

74. The sampling scheme was guided by a prospective impact evaluation design taking into account the project’s implementation. The data generated in the survey were guided by a theory of change. It covers both background and outcome indicators of the project impact at the intermediate and final outcome levels. This report presents the main results of the data generation.

75. The selection of project areas was based on a combination of two factors: (i) prevalence of water source–related health issues such as arsenic poisoning, fluorosis, and salinity–related inconvenience and diseases; and (ii) lack of piped water supply. For the entire state and project areas, there is a need to strengthen the institutional and operational capacity of local bodies—gram panchayats in the case of the project—in managing the water system, which is critical in maintaining water assets and services.22 In each project district, not all blocks are selected as project areas because of resource constraints. There is also no explicit targeting of blocks by socioeconomic status (e.g., poverty). There are comparable blocks, however, in the same district that can be used as comparison blocks for every project block for

22 Gram panchayats are the only grassroots–level of local self–governance system formalized under Panchayati Raj institution in India at the village level.
the purpose of impact evaluation. Moreover, the treatment and comparison villages have been randomly selected from treatment and comparison blocks, respectively.

76. The indicators generated in the survey were benchmarked, when comparable statistics are available, with those also generated in the 2015–2016 National Family Health Survey (NFHS-4) for West Bengal. These were found to be comparable even though the survey covers specific districts while the NFHS-4 is statewide. For instance, the average household size in the survey is 4.15 members while in the NFHS-4, it is 4.3 members. The proportion of males in the household is 54% compared to 50.3% in NFHS-4.

77. The survey finds that the three major sources of drinking water for the sample households include tube well or borehole (43%), public hand pump (34%), and private handpump (13%). Between project and non-project areas, there is a lower proportion of households using public handpump in project areas (28% vs. 41%) and a higher proportion of households using tube well/bore hole (46% vs. 40%) and bottled water (6% vs. 2%).

78. For those with public water supply sources, water supply for human consumption (e.g., handwashing, drinking, toilet use, and cooking), is available from 40 to 44 hours per week and is lower in project areas compared to non-project areas. A lower proportion of households use motorized pumps in project areas compared to non-project areas (4% vs. 8%).

79. For those who have no water source in the premises, the frequency of fetching water for drinking is on average 2.7 times per day, and in this, there is no significant difference between project and non-project areas. The average travel time per trip is 6.4 minutes and another 7.9 minutes waiting time at the source. Again, there is no difference between project and non-project areas. While almost everybody fetches water, the male head of households and female spouse are the most reported as the ones fetching water. The qualitative interviews reveal that in blocks with predominantly Muslim population, women typically do not go beyond 50 meters away from their residence. Instead, men fetch drinking water from far away sources by bicycle and carry more buckets per trip. The reported average distance to the water source is 0.75 kilometers. The households in project areas are spending more than double compared to non-project areas to purchase water (₹309 vs. ₹132 per month) and more (18% vs. 6%) are complaining about muscle strain from carrying water.

80. The estimated incidence of arsenic poisoning, fluorosis, and water salinity health-related issues is comparable to some of the documented estimates found during the project preparation. For instance, the survey finds that the reported incidence of arsenic poisoning, fluorosis, and water-salinity-related diseases, such as high blood pressure, is 14% while ADB’s Report and Recommendation of the President reported 8% for arsenic at the habitation level. Since the survey result is based on self reporting of the respondents, statistical error for interpretation of the results is possible. This may imply the need for more technical measurement to substantiate the incidence level reported.

81. The incidence of diarrhea for children under five years old, as reported in the survey, is lower (2.3%) compared to the 5.9% as reported in the NFHS-4. Comparing the treatment and comparison households, the incidence of diarrhea among children under five years old is higher in treatment compared to comparison households (3.7% vs. 1%).
Households reported to have, on average, more than two members engaged in market work with income. The reported average monthly labor market income is ₹12,909. There is no significant difference between project and non-project households in the number of members working and in labor market income. The survey also finds that households spend an average of ₹8,216 per month. Food accounts for 54% of the household expenditure. Education and health accounts for 6% each while water accounts for only 0.4%. Households in project areas were found to spend more, and their expenditure shares are also significantly different from non-project areas except for education, entertainment, and house rent.

Finally, what do these comparisons between characteristics of treatment and comparison households mean for subsequent impact evaluation? As already mentioned, many of the background and outcome characteristics are similar for project and non-project areas. There are, however, a considerable number of characteristics that are significantly different based on a test in the difference of means. This is to be expected because random assignment of project and non-project areas was not feasible under the project’s implementation design. The prospective impact evaluation needs to consider the differences between project and non-project areas, as reported in this study.

V. RECOMMENDATIONS FOR POST-PROJECT EVALUATION

The baseline evaluation survey was designed, planned, and executed taking into account the intended impact, outcomes, and outputs of the WBDWSIP. The project is expected to be completed by 2024, and the post-project impact evaluation survey conducted by the end of 2024 or by 2025. The baseline evaluation study experience has brought out some lessons wherein the following recommendations are drawn upon:

- The baseline survey questionnaire was designed to cover key intermediate and final outcomes of a water project as described in the theory of change (Figure 1). As a baseline study this report focuses on identifying similarities and differences between treatment and comparison areas that would be useful for impact analysis at the end of project. The post-project evaluation should consider including other methodologies and data generation methods that could provide a more holistic view of what happens in the ground.
- For post-completion impact analysis, secondary data, such as those of the National Sample Survey and the NFHS, should be used at all possible levels to substantiate and validate survey data. In addition, qualitative methods and social analysis would enrich the quantitative aspect of the post-project evaluation.
- It is important to involve a public health specialist whose inputs on public health issues related to water quality and sanitation would be a key contribution in identifying project objectives and principles. The public health specialist could provide those inputs during the post-project impact assessment, and in the qualitative aspects of the evaluation survey.
- The post-project impact assessment report should include impact stories that will bring in the social aspects of the study, such as how project interventions have changed individuals’ lives to a better future, and how they have uplifted the quality of life of people from all socioeconomic strata. Apart from providing documentary evidence of project interventions, these stories will

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23 The mean values for treatment and comparison groups are considered different.
showcase the human face of the project, the changes that have taken place, and the long-term impact of development initiatives.

- Lastly, the surveyors should be trained with the basic technical know-how of water supply/sources and sanitation systems in rural Bengal. A better understanding of water and sanitation systems prior to commencement of the survey should be part of the induction process.

Typical practice of sharing water source and water storage at households in Purba Medinipur district (photo from ABAR Conseil Private Limited).
All information collected will be held strictly confidential on behalf of the Asian Development Bank.

**West Bengal Drinking Water Sector Improvement Project**
**HOUSEHOLD SURVEY**
(Public Health Engineering Department, Government of West Bengal)/ADB/(Survey Firm xxxx)

**Informed Consent**
My name is................. I am here from (Name of Survey Firm) to collect data for a research study in coordination with (name of implementing department), and ADB. During this study, I will ask you some questions related to water supply, sanitation, health, hygiene, income, and expenditure. We would very much appreciate your participation in this survey. This survey will take about XX minutes. Your participation in this survey depends on your wish. The information given by you will be strictly treated as confidential. If we come to any questions that you don’t want to answer, just let me know and I will go to the next question or you can stop the interview at that time. However, I hope that you will participate in this survey and make it a success by providing honest answers to all the questions.

Would you like to ask me any questions about this survey?

May I begin the interview now?

Signature of the interviewer: _____________________________  Date:_______________ MM/DD/YYYY

Respondent agrees for interview … 1  Respondent does not agree for interview … 2

### A. HOUSEHOLD ID AND LOCATION (HI)

| HI1. Household Type: 1. Project 2. Non-Project |
| HI2. Geographic Location: |
| HI2A. DISTRICT | Name | Code/Number |
| HI2B. BLOCK |
| HI2C. PANCHAYAT |
| HI2D. VILLAGE |

**Information on the respondent:**

| HI3. Name of respondent: |
| HI4. Address: |
| HI7. Date of interview (MM/DD/YYYY) | _ _ / _ _ / _ _ _ _ |
| HI8. Interview start time | HH:MM:________ |

**Survey Personnel Information (to be entered later):**

| HI9. Enumerator | Name | Code |
| HI10. Supervisor |
| HI11. Data encoder (In office) |

Questionnaire Check Date: ______/_____/____
| Line Number | Name of HH members | DEMOGRAPHIC DATA (All household members) | EDUCATION (For all HH Members) | EDUCATION (ED) (For 6 years up to 17 years) |
|-------------|--------------------|------------------------------------------|---------------------------------|-------------------------------------------|
|             | Name               | Last name, First name                   | Please put in line 1 the household head (Write also first names in col HH2 of Pages 3-8) |                                            |
|             | Is (NAME) relationship to household head (see codes below) | What is (NAME) male or female 1-Male 2-Female | What is (NAME) age (completed years) | Which community does HoH belong to? (see codes below) |
|             | Is (NAME) relationship to household head (see codes below) | What is (NAME) marital status (see codes below) | What is the highest standard/year of school (NAME) completed (see codes below) | Is (NAME) still attending school? See code below |
|             | Is (NAME) relationship to household head (see codes below) | What is (NAME) age (completed years) | What is the highest standard/year of school (NAME) completed (see codes below) | What standard/year is (NAME) attending? (See code below) |
|             | Is (NAME) relationship to household head (see codes below) | What is the highest standard/year of school (NAME) completed (see codes below) | Is (NAME) still attending school? See code below | In the past month, how many days (NAME) was absent in the school (See code for reason of absence) |
|             | Line Number        | Name                                      | Last name, First name                   |                                            |
|             |                   |                                           | Please put in line 1 the household head (Write also first names in col HH2 of Pages 3-8) |                                            |
|             |                   | Is (NAME) relationship to household head (see codes below) | What is (NAME) male or female 1-Male 2-Female | Which community does HoH belong to? (see codes below) |
|             |                   | What is (NAME) marital status (see codes below) | What is the highest standard/year of school (NAME) completed (see codes below) | Is (NAME) still attending school? See code below |
|             |                   | What is the highest standard/year of school (NAME) completed (see codes below) | Is (NAME) still attending school? See code below | In the past month, how many days (NAME) was absent in the school (See code for reason of absence) |

**Code for Marital Status (HH6)**
- 1-Currently married
- 2-Married, but staying with parent (for female member)
- 3-Divorced
- 4-Separated
- 5-Widowed
- 6-Deserted
- 7-Never married
- 8-Married
- 9-Unmarried
- 10-Never married

**Code for Community (HH9/ED2)**
- 1-Gen
- 2-SC
- 3-ST
- 4-OBC
- 5-Other minority
- 6-Bachelors’ degree
- 7-Masters’ degree
- 8-PhD
- 9-B.E/B.Tech/M.BBS
- 10-Children/Less than 6 years old attending ICDS/KG
- 11-Others

**Code for grade completed (HH9/ED2)**
- 1-Illiterate
- 2-Up to class 4
- 3-Up to class 8
- 4-Up to class 10
- 5-Up to class 12
- 6-Bachelors’ degree
- 7-Masters’ degree
- 8-PhD
- 9-B.E/B.Tech/M.BBS
- 10-Children/Less than 6 years old attending ICDS/KG
- 11-Others

**Code for reason for absence (ED4)**
- 01-Transport issues
- 02-Poor quality of school/teachers
- 03-Needed to work to support self/family
- 04-Needed for farm work
- 05-Needed for HH chores
- 06-Needed for skill training
- 07-Marriage
- 08-Own illness/disability
- 09-Other
- 10-No female teacher
- 11-Repeated failures
- 12-Not interested in studies
- 13-Repeat

**Code for not attending school (ED5)**
- 01-School too far away
- 02-Transport not available
- 03-Further education considered not necessary
- 04-Required for HH work
- 05-Required for family business
- 06-Required for wage labor outside
- 07-Cost too much
- 08-No proper toilet facilities in school for girls
- 09-Not safe to send girls
- 10-No female teacher
- 11-Required for care of siblings
- 12-Not interested in studies
- 13-Repeated failures
- 14-Did not get admission
- 15-Other reasons (specify)
- 16-Don't know
| Line Number | Name (Copy from HH2) | Has (NAME) had diarrhea/dysentery in the past four weeks? | How many times per day during the episode? | Was there blood in the stools? | Did (NAME) also have fever? | Did (NAME) have abdominal cramps? | What do you think was the main cause of the diarrhea? (see codes below) | During the last month, how many days could not do the usual activities due to diarrhea? (00 if none) | If yes in HE1-1 | If yes, where did (NAME) seek advice or treatment? (see codes below) | If no (in HE1-9), why not seek advice/treatment? (see codes below) | How much did you spend for the treatment? | Rs. |
|-------------|---------------------|----------------------------------------------------------|------------------------------------------|-----------------------------|-------------------------------|-----------------------------|--------------------------------|-------------------------------------------------|----------------|----------------------------------|-----------------------------------------------|----------------|------|
| HH1        | HH2                 | HE1-1                                                    | HE1-2                                    | HE1-3                        | HE1-4                         | HE1-5                        | HE1-6                          | HE1-7                                      | HE1-8           | HE1-9                             | HE1-10                         | HE1-11 | HE1-12 |
| 01          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 02          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 03          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 04          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 05          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 06          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 07          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 08          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 09          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |
| 10          |                     |                                                          |                                           |                             |                              |                             |                                |                                               |                 |                                   |                               |                   |       |

**Code for main cause (HE1-7)**

01-Water  
02-Food poisoning  
03-Person-to-person  
04-Animal contact  
05-Non-specific infection  
06-Pregnancy/menstruation  
07-Medication

**Code for where seek treatment (HE1-10)**

01-HP/HC  
02-Government hospital  
03-Municipality hospital  
04-Government doctor/paramedic  
05-Private doctor/private clinic  
06-Private hospital  
07-Pharmacist

**Code for why not seek advice / treatment (HE1-12)**

01-Illness not serious enough to seek advice / treatment  
02-Lack money for treatment  
03-Health facility/doctor etc. too far  
04-Believes no one available to seek advice / treatment from  
96-Others (specify)  
98-Don’t know
| HEALTH (CONTINUED) |  |
|-------------------|---|
| HE2-1             | Have you ever heard of arsenic poisoning, fluorosis (affecting bones and teeth) and other diseases that are mainly attributed to consumption of ground water with high arsenic and fluoride content? | 1. Yes 2. No |
| HE2-2             | Are you aware that there is evidence that drinking water salinity is linked to higher blood pressure? | 1. Yes 2. No |
| HE2-3             | Have any of your family members been diagnosed with arsenic poisoning, fluorosis or high blood pressure? | 1. Yes 2. No |
| HE2-4             | If yes in HE2-3, what type of disease?* (Please tick whichever is applicable) | 1. Arsenic poisoning related diseases 2. Skeletal fluorosis 3. Dental fluorosis 4. High blood pressure 5. Skin disease |
| HE2-5             | What kind of symptoms have prompted you to seek medical counsel in the past? |  |
| HE2-6             | Which household member(s) is/are affected? | Code no. of rel. to HoH may be mentioned |
| HE2-7             | Is the affected household member continuing with the treatment/medication? | 1. Yes 2. No 3. Intermittent |

*Instruction for enumerator: Please check last prescription if available.
## HOUSEHOLD OR COMMUNITY WORK (HW)

Record only the unpaid/voluntary activities meant for the household or community.

*(Do not ask for the household members who are continuously living in other town or abroad over the last two months or more)*

| Line Number | Name (Copy from HH2) | Collecting firewood, fodder, grass/Taking care of animals | Making mats, knitting, weaving, tailoring (these can be for income) | Processing preserved food/snacks (pickle, jam, wine, puffed rice, Bodi) (Can be for income) | Caring for elderly, sick, disabled/Babysitting | Cleaning house, laundry, dishwashing, cooking | Marketing/(incl sale of HH products) | Other volunteer/SHG activities/community services | Total hours in the last 7 days (HW1 to HW8) |
|-------------|----------------------|----------------------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------|---------------------------------------------|---------------------------------------------|---------------------------------------------|
| HH1         | HH2                  | HW1                                                      | HW2                                                           | HW3                                                                 | HW4                                           | HW5                                           | HW6                                         | HW7                                         | HW8                                         | HW9                                         |
| 01          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 02          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 03          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 04          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 05          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 06          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 07          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 08          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 09          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
| 10          |                      |                                                           |                                                               |                                                                   |                                               |                                               |                                             |                                             |                                             |                                             |
**JOB MARKET WORK (5 years and older) (MW)** *(Do not ask for household members who have been continuously living in other town or abroad over the last 2 months or more)*

| Line Number | Name / Code of Rel. to HoH (Copy from HH2) | Did (NAME) do any work for pay, for profit, or for family gain or in own enterprise in the past week? | What is (NAME) type of work performed (spent most time)? | What is (NAME) institutional sector of employment? | How is (NAME) paid in this job? | How much did (NAME) get in cash per day equivalent for this job? | If (NAME) has an enterprise, how many employees? (including family members and hired) | If not | What is the main reason for not looking for job (If ‘no’ in MW11) or not working (If ‘yes’ in MW11)? |
|-------------|--------------------------------------------|---------------------------------------------------------------|----------------------------------------------------------|---------------------------------|-------------------------------|---------------------------------------------------------------|-----------------------------------------------|-------|------------------------------------------------------------------|
| HH1         | HH2                                       | MW1                                                           | MW2                                                      | MW3                             | MW4                           | MW5                             | MW6                             | MW7 | MW8 | MW9 | MW10 | MW11 | MW12 |
| 01          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 02          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 03          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 04          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 05          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 06          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 07          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 08          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 09          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |
| 10          |                                            |                                                               |                                                          |                                 |                               |                                 |                                 |                               |                               |                               |                               |                               |                               |

**Code for nature of employment (MW3):**
1-Paid employee  
2-Operating own business or farm with regular paid employees  
3-Operating own business or farm without regular paid employees  
4-Contributing family member without pay  
96-Others, specify ______  
(e.g., teacher, priest, lawyer, private medical practitioner)

**Code for institutional sector of employment (MW4):**
1-Government services  
2-Public sector/corporation  
3-Private sector/corporation  
4-NGO  
5-Private/informal sector (Brick kiln)  
6-Govt. scheme job/ non-regular (MGNREGS)  
7-Unemployed

**Code for reason for not working now / looking for work (MW12):**
01-Waiting to start arranged job/business  
02-Student  
03-House duties  
04-Disability/Long-term illness  
05-Retired  
06-Work not available  
07-Waiting for job inquiries  
08-Off season  
09-Too young  
96-Others (specify)__________________
### WATER SUPPLY (WS)

|   | Drinking | Hand washing | Cooking | Toilet | Gardening | Other domestic uses (bathing, laundry, etc.) | Livestock | Total |
|---|----------|--------------|---------|--------|-----------|---------------------------------------------|-----------|-------|
| **WS1** | What is the main source of (See codes below) | | | | | | | |
|   | If source is not on premises, skip to WS15 | | | | | | | |
| **WS2** | How many hours supply of tap water per week? | | | | | | | |
| **WS3** | How is the pressure of the water supply? 1-Good, 2-Fair, 3-Poor | | | | | | | |
| **WS4** | How many times did the supply breakdown last year? | | | | | | | |
| **WS5** | How quickly are breakdowns fixed (1-Same day, 2-Within 2 days, 3-Within a week, 4-Other) | | | | | | | |
| **WS6** | Do you have motorized pump to pump water? | 1-Yes | | 2-No | | | | |
| **WS7** | If, yes how much do you spend per month for pumping water? | | | | | | | |
| **WS8** | How much do you spend per month on maintenance of pump? | | | | | | | |
| **WS9** | If not available on premises or source outside the premises is also used | Drinking | Hand washing | Cooking | Toilet | Gardening | Other domestic uses (bathing, laundry etc.) | Livestock | Total |
| **WS10** | Line number (HH1) of who usually goes to fetch water for each water use | | | | | | | |
| **WS11** | How many times in a day does household fetch water | | | | | | | |
| **WS12** | How much time (minutes) it takes to fetch water, on average? | | | | | | | |
| **WS13** | How is water usually transported from source? 1-By foot, 2-Bicycle, 3-Motorcycle, 4-Other private motorized vehicle, 5-Others | | | | | | | |
### Code for main source of water (WS1)

| WATER SUPPLY (WS) (continued) |
|-------------------------------|
| **WS14** What is the approximate distance (in kilometers) to the main source of water? |
| **WS15** Do you purchase water? If yes, how much do you pay per month? |
| **WS16** Do any of the family members suffer from muscle strain, blisters or backache from carrying water from source? |
| 1-Yes |
| 2-No |
| 9-Don’t know |

The following questions apply to all households

| **WS17** Do you treat water to make it safer to drink? |
| 1-Yes |
| 2-No |
| If No, Skip to WS20 |

| **WS18** If yes, what do you usually do to make water safer to drink |
| 1-Boil |
| 2-Use alum |
| 3-Add bleach / chlorine |
| 4-Strain through a cloth |
| 5-Use water filter (ceramic, sand, composite etc.) |
| 6-Use electronic purifier |
| 7-Let it stand and settle |
| 8-Others (specify) ______________ |

| **WS19** How much do you spend for treatment per month? |
| Rs. |

| **WS20** Do you store your drinking water? |
| 1-Yes |
| 2-No (Skip to WS26) |

| **WS21** If yes: How do you store drinking water? |
| 1-In containers/vessels |
| 2-Roof tank or cistern |
| 3-Underground tank |
| 4-Others (specify) ______________ |

| **WS22** Any measures taken to avoid contamination of stored water? |
| 1-None |
| 2-Cover the containers |
| 3-Use cup/ladle with long handle |
| 4-Clean vessel regularly |
| 5-Keep vessel in a clean place |
| 6-Others, specify ______________ |

**Quality of Water**

| Drinking | Hand washing | Cooking | Toilet | Gardening | Other domestic uses (bathing, laundry, etc.) | Livestock |
|----------|--------------|---------|--------|-----------|---------------------------------------------|-----------|
| **WS23** Color (1-Clear, 2-Fair, 3-Dirty) |
| **WS24** Odor (1-None, 2-Some smell, 3-Strong smell) |
| **WS25** Taste (1-Good, 2-Fair, 3-Bad) |
| **WS26** Are you satisfied with the quality of water supplied (1-Satisfied, 2-Fairly Satisfied, 3-Not satisfied) |
| **SANITATION FACILITIES AND PRACTICES (SP)** |  |  |
|---------------------------------------------|-----------------------|-----------------------|
| **SP1** What kind of toilet facility do members of your household usually use? | 01- Flush or pour toilet to piped sewer system |  |
|  | 02- Flush or pour toilet to septic tank |  |
|  | 03- Flush to pit latrine |  |
|  | 04- Flush or pour toilet to somewhere else |  |
|  | 05- Flush or pour toilet to don’t know where |  |
|  | 06- Ventilated improved pit latrine |  |
|  | 07- Pit latrine with slab |  |
|  | 08- Pit latrine without slab/open pit |  |
|  | 09- Twin pit/Composting toilet |  |
|  | 10- Dry toilet |  |
|  | 11- No toilet facility |  |
| **SP2** Is it for your own use or shared with other households? | 1- Own use | if 11, Skip to SP5 |
|  | 2- Shared |  |
| **SP3** Do you/family members follow healthy habits after coming from toilet? | 1- Washing hands with soap/cleansing materials |  |
|  | 2- Washing hands without soap |  |
|  | 3- Cleaning toilet |  |
|  | 3- Changing clothes |  |
|  | 4- Bathing |  |
|  | 5- Any other |  |
| **SP 4** Are you connected to a sanitary system for liquid wastes? | 1- Underground drains |  |
|  | 2- Open drains |  |
|  | 3- Soak pit |  |
|  | 4- No |  |
|  | 98- Don’t know |  |
| **SP 5** Have any of your children missed school due to lack of poor toilet facilities | 1- Yes, indicate line number in roster |  |
|  | 2- No (School has facility) |  |
|  | 3- Don’t have school going children |  |
|  | 96- Other (specify)___________ |  |
| **SP 6** Has any family member attended hygiene and sanitation education sessions? | 1- Yes 2- No 3- Never heard. If yes, who organized? |  |
|  | 1- NGO 2- School |  |
|  | 3- ASHA/ANM staff |  |
|  | 4- Government health department |  |
|  | 96- Others (specify) |  |
| **SP 7** Who attended these sessions? | 1- Adult male |  |
|  | 2- Adult female |  |
|  | 3- School going boy |  |
|  | 4- School going girl |  |
### Income (monthly average) of members working in the job market (refer to Job Market Work [MW] module)

| Line No. (HH1) | Name (HH2) | Pay per day (MW6) | Avg no. of days worked per month paid in cash | Total pay in cash per month | Payment in kind per day (MW7) | Avg no. of days worked per month paid in kind | Total pay in kind per month | Remarks |
|----------------|------------|-------------------|--------------------------------------------|-----------------------------|-------------------------------|---------------------------------------------|---------------------------|---------|
| HH1            | HH2        | IN1 IN2           | IN3=IN1*IN2                                | IN4 IN5                     | IN6=IN4*IN5                   |                                             |                           |         |
|                |            |                   |                                            |                             |                               |                                             |                           |         |
| **Total**      |            |                   |                                            |                             |                               |                                             |                           |         |

### Expenditure (Total HH Expenditure per month/year)

- **EX0** Total
- **EX1** Food
- **EX2** Beverages and tobacco
- **EX3** Clothes and personal care items
- **EX4** Medical
- **EX5** Education
- **EX6** Water
- **EX7** Fuel and lighting
- **EX8** Transport and communications (landline, mobile phone)
- **EX9** Entertainment
- **EX10** Housing repairs
- **EX11** Rent (rent or imputed rent of own home)
- **EX12** Others
- **Total**
| HC1 | House Type | Kachha: Temporary | Pucca: Permanent | Semi-pucca: Semi-permanent |
|-----|------------|-------------------|-----------------|---------------------------|
| Code | 1. Kachha – Mud, bamboo, wooden, stone wall; Thatched, tin, tile, stone, wooden roof; mud, stone, wooden floor | 2. Pucca – Masonry work, RCC, brick and cement structure – for wall, floor, roof | 3. Either roof or wall or floor – any of these of permanent materials and rest of temporary materials |
| HC2 | How many rooms do you have? ___ | HC 3 Garden: 1-yes 2-no | HC 4 Separate kitchen: 1-yes 2-no |
| HC3 | Fuel used: | Code: 1-Cow dung, firewood, dry leaves | 2-Kerosene oil | 3-Coal | 4-Biogas | 5-LPG | 6-Electricity |
| HC4 | Assets (Only note those owned by HoH – not joint owner) | Area/Number | Unit | Value (Rs) |
| 1. | House | Sqm | | |
| 2. | Land – residential | Katha/ Decimal | | |
| 3. | Agricultural land | Katha/ Decimal | | |
| 4. | Equipment: Agricultural implements (traditional) | Numbers | | |
| 5. | Cart, cycle | Numbers | | |
| 6. | Motorcycle, scooter | Numbers | | |
| 7. | 4 wheelers (car, van) | Numbers | | |
| 8. | Tractor, power tiller, threshers, harvester | Numbers | | |
| 9. | HH Individual equipment: Carpenter, handloom, plumber | Numbers | | |
| 10. | Animals: Bullock (plough) | Numbers | | |
| 11. | Cow, buffalo (milch) | Numbers | | |
| 12. | Goat, duck, poultry, piggery | Numbers | | |
| 13. | Consumer durables: Gas stove | Numbers | | |
| 14. | Refrigerator, microwave oven | Numbers | | |
| 15. | TV, music system | Numbers | | |
| 16. | Others | | | |

THANK YOU VERY MUCH FOR YOUR COOPERATION. END OF INTERVIEW. NOTE HH:MM _________
Signature of the Respondent _________________________________________________________________

Gen = general caste, HH = household, HOH = head of household, SC = scheduled caste, ST = scheduled tribe.
APPENDIX 2

Sampling Scheme

The sampling scheme is a clustered design with *gram panchayats* (GP) as clusters and households in those GPs as observation units. A cluster sample size of 30 households was used. Given the number of households per cluster, the number of sample GPs per district was determined proportional to the number of households per district. Two outcomes were used to compute the sample size: diarrhea incidence and school attendance. These two outcomes are among the primary outcome variables the project is interested in that are available in the dataset. The sample size was determined using 0.05 significance level and 0.8 power (Appendix 3). This sample size can detect as small as 0.15 standard deviation for diarrhea and 0.20 standard deviation for school attendance. The determined cluster sample size of 30 translates to about 66 GPs or 33 treatment and 33 comparison GPs, or a total estimated sample size of about 2,000 households. The distribution of the sample GPs across the three districts (Bankura, East Medinipur, and North 24 and South 24 Parganas) is shown in column 7 of Table 2-A.

### Table A2: Sampling Allocation

| District                  | Total No. of GPs* | Total No. of GPs with Codes** | Total No. of Households* | Prop. to Total | No. of Sample GPs | Code-Adjusted Sample GPs | Total No. of Sample Households |
|---------------------------|-------------------|-------------------------------|--------------------------|----------------|------------------|--------------------------|-------------------------------|
| Bankura                   | 31                | 30                            | 120,170                  | 0.1317         | 4                | 5                        | 300                           |
| Purba Medinipur           | 17                | 16                            | 331,054                  | 0.3629         | 12               | 14                       | 840                           |
| North (and South) 24 Paraganas | 18            | 14                            | 461,109                  | 0.5054         | 17               | 14                       | 840                           |
| Total                     | 66                | 60                            | 912,333                  | 1.0000         | 33               | 33                       | 1,980                         |

* Based on Census Annexure files.
** Some *gram panchayats* (GP) did not have clear codes needed for merging data from different sources to do matching based on characteristics.
Source: Census of India, 2011.

The treatment GPs per district were randomly selected from the identified project GPs. The selection of matching comparison GPs for each of the treatment GP was done in two steps. The blocks in each project district were matched first, and within those matched blocks, the matched GPs were selected. The characteristics used for matching blocks include number of households, total land area, number of villages (only at block level), population density, proportion of area irrigated, proportion of the population in scheduled caste, proportion of the population in scheduled tribe, proportion of illiterate population, proportion of working population, and proportion of the households with tap water. The same characteristics, depending on the availability of data, were used to match GPs, except for the number of GPs.
Calculating Power and Sample Size for the West Bengal Drinking Water Sector Improvement Project

Preliminaries

1. This note describes the power and sample size calculation for the West Bengal Drinking Water Sector Improvement Project (WBDWSIP).

2. The data set used to compute power and sample size is the Demographic and Health Survey dataset for West Bengal officially called the National Family Health Survey (NFHS-4) for 2015–2016. The choice of the dataset is based on two considerations: (i) it has data on the primary outcomes of the project such as incidence of diarrhea and school attendance for the area of interest (i.e., West Bengal), and (ii) it is recent.

3. As mentioned in the initial evaluation design note, the project has pre-selected 66 project GPs that will receive the interventions. The evaluation will then identify matching GPs to the pre-selected project GPs as the counterfactual GPs. Gram panchayat characteristics will be used to match treatment and comparison GPs. Hence, the sampling will be a clustered design with GPs as clusters and households in those GPs as observation units.

4. The clustering variable that will be used in the subsequent calculation is the primary sampling unit (PSU) (hv021) of the NFHS-4.

5. Two outcomes will be used to compute the sample size: diarrhea incidence and school attendance. These are among the primary outcome variables the project is interested in that are available in the dataset.

6. The power and sample size estimation use the power routine in Stata. Given the nature of the outcomes that will be used (i.e. proportions), and since the sample will be used for impact evaluation, the estimation will use a difference in two proportions to determine the sample size.

7. The parameters of the estimation are the commonly accepted ones such as 0.05 level of significance and 0.8 power. The cluster sample size is 30 households.

Diarrhea

8. The NFHS-4 estimates the incidence of diarrhea among children 0 to 59 months old in West Bengal to be 0.061 with a standard deviation of 0.239. The intra-cluster correlation is estimated to be 0.028.

9. Given the aforementioned parameters, the power curve (Figure A3.1) shows that the corresponding number of clusters needed for reducing diarrhea by 0.1SD, 0.15SD, or 0.20SD are 77, 31, and 15, respectively, for each treatment arm.

School Attendance

10. The NFHS-4 data estimates the school attendance of children 6-17 years old to be 0.891 with standard deviation (SD) of 0.312. The ICC is estimated to be 0.055.

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1 International Institute for Population Sciences (IIPS) and ICF. 2017. Ministry of Health and Family Welfare, Government of India: National Family Health Survey (NFHS-4), India, 2015-16: West Bengal. Mumbai.
2 hv021 is the variable name of the primary sampling unit in NFHS-4.
11. Power calculations using these parameters yielded 118, 49, and 25 GPs per treatment arm corresponding 0.1 SD, 0.15 SD, and 0.20 SD, respectively, increase in school attendance as shown in Figure A3.2.

**Figure A3.1: Effect Size and Number of Clusters for Diarrhea for Children 0-59 Months Old**

Source: Asian Development Bank.

**Figure A3.2: Effect Size and Number of Clusters for School Attendance for Children 6-17 Years Old**

Source: Asian Development Bank.
Summary

12. Table A3 shows the summary of the power and sample size calculations at significance level of 0.05, power of 0.8, and cluster sample size of 30. It shows that the required number of GPs at 0.10$\sigma$, 0.15$\sigma$, and 0.20$\sigma$ for diarrhea representing a change of $-0.024$, $-0.036$, and $-0.048$ are 154, 62, and 30 GPs, respectively. In the case of school attendance, the required number of GPs for a change of 0.031, 0.047, and 0.062 are 236, 98, and 50, respectively.

13. Even though the 0.10$\sigma$ effect size of $-0.024$ for diarrhea appears to be small, this already represents 39\% of the current diarrhea incidence rate of 0.061. This is a change that may already be challenging to achieve. Given this, it can be considered as a binding constraint to sample size estimation (i.e., the recommended minimum number of GPs to sample is 154 or 77 in each of the project and comparison GPs). However, the total number of treatment GPs identified for the project is 66. This means that there is a need to include all the 66 GPs identified for the project and identify another 66 non-project GPs in the districts as comparison GPs. With 66 GPs for each treatment arm, the study will be able to detect as low as 0.032 difference in diarrhea incidence and a 0.041 difference in school attendance. This translates to a total of 3,960 households at 30 households per GP.

Table A3: Power and Sample Size Calculation

| Summary | Diarrhea | Attendance |
|---------|----------|------------|
| Effect size |          |            |
| .10$\sigma$ | 0.024    | 0.031      |
| .15$\sigma$ | 0.036    | 0.047      |
| .20$\sigma$ | 0.048    | 0.062      |
| Parameters |          |            |
| Control mean | 0.061    | 0.891      |
| Control SD   | 0.239    | 0.312      |
| ICC          | 0.028    | 0.055      |
| Cluster size (30) |            |            |
| Sig (.05)    |          |            |
| Power (.8)   |          |            |
| Villages needed |        |            |
| .10$\sigma$ | 154      | 236        |
| .15$\sigma$ | 62       | 98         |
| .20$\sigma$ | 30       | 50         |
| Sample size needed |    |            |
| .10$\sigma$ | 4,620    | 7,080      |
| .15$\sigma$ | 1,860    | 2,940      |
| .20$\sigma$ | 900      | 1,500      |

ICC = intra-cluster correlation, SD = standard deviation.
Source: Asian Development Bank.
APPENDIX 4

GOVERNMENT OF WEST BENGAL
DEPARTMENT OF HEALTH & FAMILY WELFARE
(Medical Service Branch)
Swasthya Bhawan, GN29, Sector V, Salt Lake Kolkata-91

No: HF/O/MS/ 984/W-10/2001    Dated Kolkata the 22nd October 2014

ORDER

The User charges for diagnostic, therapeutic, surgeries, cabins and other hospital services were introduced by this department vide GO No. HF/O/MS/121/W-10/2001 dated 18th March 2002, applicable in all secondary hospitals, decentralized hospitals and tertiary teaching hospitals under the administrative control of this department.

The policy of user charges has been reviewed by this department with a view to further reduce the Out of Pocket Expenses (OOPE) of BPL, weaker sections of society, mother & child and a large number of vulnerable patients coming to the Government Health facilities for their treatment.

After careful reviewing the financial implications of the policy of user charges on accessibility and equity of services in secondary hospitals and in partial modification of the GO No. HF/O/MS/121/W-10/2001 dated 18th March 2002, the Governor is pleased to withdraw the user charges imposed in all the secondary and primary hospitals of the State and ordered to allow free diagnostics, pathology, therapeutic & surgeries and beds by modifying the provisions of the said order.

1. The Governor is further pleased to order that provisions of cabin charges, paying beds/ cabins in the said GO cease to exist allowing free services to all patients in Government run Primary and Secondary hospitals under Health & Family Welfare Department. All the patients in the hospitals will be treated at par with principle of equity and universal access to health care services.

2. The provisions of the said GO will continue to be applicable in Tertiary Care Hospitals (Medical College Hospitals and other Teaching hospitals) till further orders.

3. These orders will not be applicable to any diagnostic, imaging, pathological and testing services by private partners in PPP agreement with the Department or the hospital authorities/ Societies under the
administrative control of this department without affecting provisions of concession agreements/service agreement or similar arrangements.

4. Provisions of bed rent, cabin rent, user charges for diagnostic services, pathology, imaging, scanning, therapeutic services, surgeries and hospitalization charges as contained in all existing GO cease to exist in all District Hospitals, Decentralized hospitals, Mental hospitals, Sub-divisional hospitals, State General Hospitals and Primary hospitals (BPHC, Rural Hospitals, PHCs) or any other category hospitals except those mentioned in para 2.

5. The Patients attending OPD will be charged Rs 2/- (Rupees Two) for OPD ticket in the above mentioned hospitals as usual. In case of referral from one department to other in the same institution, no charge for new OPD ticket, shall be levied.

6. This order is issued with the concurrence of Finance Department vide UO NO: Group-1/O/2014-2015/0102 Dated 22.10.14

7. This order will come into force with immediate effect.

8. All concerned are being informed.

By Order of Governor

[Signature]

Principal Secretary
Health & Family Welfare Department

No. HF/O/MS/ 984 /W-10/2001/1(5) Dated Kolkata the 22nd October 2014

Copy with copies of annexure forwarded for information and necessary action to the:-

1) Principal Accountant General (A&E), West Bengal, Treasury Buildings, Kolkata-700001.

2) Accountant General (Audit), West Bengal, Treasury Buildings, Kolkata - 700 001.

3) Accountant General (Local Bodies Audit), West Bengal, C.G.O. Complex, 3rd M.S.O. Building (5th Floor). DF Block, Salt Lake City. Kolkata-700064.
4) Pay & Accounts Officer, Kolkata Pay & Accounts Office, 81/2/2,
Phears Lane, Kolkata-700012.

5) Treasury Officer ____________________________

Deputy Secretary to the Govt of West Bengal

No. HF/O/MS/ 984 /W-10/2001/2(1) dated Kolkata the 22nd October 2014
Copy forwarded for information and necessary action to the Finance Department (Group-'O').

Deputy Secretary to the Govt of West Bengal

No. HF/O/MS/ 984 /W-10/2001/3(20) Dated Kolkata the 22nd October 2014
Copy forwarded to the:-

1. DHS and e.o Secretary, West Bengal
2. DME and e.o Secretary, West Bengal
3. Executive Director, State Health & F.W Samity., Govt, of West Bengal;
4. Financial Advisor, Health and Family Welfare Department
5. Special Secretary (MERT), West Bengal with a request to circulate this order to the concerned MSVPs in his jurisdiction.
6. Addl. Director of Health Services (AA& V), West Bengal
7. Joint Director of Health Services (Admn.), West Bengal with a request to circulate this order to the concerned Superintendents in his jurisdiction.
8. Joint Secretary (P&B), H&FW
9. Deputy Director of Health Services (P&D), West Bengal.
10. Deputy Secretary (PHP)
11.CA to Sabhadhipati,------------------------ Zill Parishad __
12.CA to District Magistrate ----------------------- District
13.Cherif Medical Officer of Health, ------------------------- Health District

for necessary communication to the concerned Superintendents/
ACMOH/ BMOHs within his jurisdiction having such health facilities covered in this order.

14. Sr. P. A. to Principal Secretary of this Department
15. P. A. to Secretary (MS) of this Department
16. PA to MD NHM and Secretary of this Department
17. PS to MOS (H&FW)
18. S.O. (MS) of this Department.
19. System Coordinator, Swasthya Bhawan for Website posting,
20. Office Copy

Deputy Secretary to the Govt of West Bengal
# APPENDIX 5

## Questionnaire for Household Survey

### 1. Basic Details
- **Surveyor ID (email)**
- **Surveyor Name**
- **Date and Time of Survey**
- **Package No.**
- **GPS Location of House (long. and lat.)**

### 2. Property Details
- **Property ID No./ Khasara/Khatauni No.**
- **Street / Gali No./ Name:**
- **House No.**
- **Name of Village:**
- **GP Ward No.**
- **District**
- **Name of GP**
- **Name of Property Owner**
- **Block**
- **Relation of the Respondent with Owner**
- **Name of Resident (if different from owner)**

### 3. General Information
- **Use Purpose of the Building**:  
  - Fully Residential
  - Fully Commercial
  - Partly Residential / Commercial
  - Clinic / Hospital
  - School / College
  - Office / Institution
  - Rental Use
- **Building Type**:  
  - Semi Pucca
  - House w. Mud Walls & Thatched Roof
  - Kachcha
  - Pucca
- **House Type**:  
  - Single Storey Building
  - Bungalow/Haveli
  - Double Storey Building
  - Others
- **No. of Persons Living Ordinarily in the House**:  
  - Male nos.:
  - Female nos.:
- **Other In-House Facilities**:  
  - Facility of Sanitary Toilets: Yes / No
  - Electricity: Yes / No
- **Existing Water Supply System**:  
  - Source of Water Supply:  
    - Wells
    - Piped Water Supply
    - Others (Please Specify)
    - Handpump
    - Borewell
    - Ponds
- **Type of Existing Connection, if any**:  
  - Personal Household Connection
  - Shared Connection
  - Group Connection
  - Public Stand Post (PSP)
- **Type of Existing Connection – part II**:  
  - Connection is metered: Yes / No
  - Connection Pipeline Size:  
    - Nil
    - < 20 mm
    - 20-50 mm
    - > 50 mm
- **Approximate Consumption in L / Day**
- **Approximate Monthly Expenditure in Rs**
| Storage Capacity | Ground Tank | Roof Tank | Others |
|------------------|-------------|-----------|--------|
| Poverty Mapping: | BPL         | APL       | None   |
| Measure of Social Vulnerability | SC | ST | OBC | General |
| Measure of Social Vulnerability – part II | Differently Abled Persons | Women Headed HH | Single Elderly Woman | Orphan Child | Nil |

4. **Photo Capture**

- BPL (It will show if user belongs to BPL)
- House / Building (GeoTag)
- Others (Optional) | Aadhar | Pan Card | Ration card | E-bill | T-Bill |

**Submit** (The surveyor will submit using app and internet connection. When done in the field, data is synchronized to server. If not, then data is stored offline, and after getting the internet connection, the offline data will be synchronized to server.)

**Surveyor** will receive receipt for submission when using app version (e.g., by receiving email, same as surveyor ID).

BPL = below poverty line, GP = gram panchayat, HH = household.
| Glossary Term | Definition |
|---------------|------------|
| *accredited social health activist* (ASHA) | one of the key components of the National Rural Health Mission is to provide every village in the country with a trained female community health activist (ASHA); selected from the village itself and being accountable to it, the ASHA workers are trained to work as an interface between the community and the public health system |
| *below poverty line (BPL)* | a benchmark used by the Government of India to indicate economic disadvantage and identify individuals and households in need of government assistance; an expert panel set up by the Government of India in 2015 put the poverty line as ₹32 a day in rural areas and ₹47 in towns and cities |
| *block or community development block (CD Block)* | a rural area administratively earmarked for development, consisting of several gram panchayats |
| *comparison block / households* | matching blocks / households outside project area |
| *gram panchayat* | an elected local administrative unit at village- or small-town level in line with local self-governance system formalized under Panchayati Raj Institution |
| *household* | a group of persons who normally live together and take food from a common kitchen |
| *leach pit* | used for containment of raw sludge; leach pits are used in conjunction with low-flush or pour-flush toilets; leach pits are dug up pits which serve a dual function: (i) storage and digestion of excreted solids and (ii) infiltration of the waste liquids; as per the practice of Swachh Bharat Mission, twin leach pits are provided so that when one gets filled up, the other one can be used |
| *on-site sanitation* | a sanitation system in which excreta and wastewater are collected, stored, or treated at the same location (or on the same plot) where they are generated |
| *other backward class (OBC)* | A collective term used by the Government of India to classify castes which are educationally or socially disadvantaged, other than scheduled caste and scheduled tribe |
| Term                                      | Definition                                                                                                                                                                                                 |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **out-of-pocket expenditure**             | payments made by an individual at the point of receiving healthcare services or goods and usually incurred when an individual’s visit to healthcare provider (i.e., clinic, hospital, pharmacy, laboratory) is not provided for free in a government health facility or a facility run by a non-profit organization, or if this individual is not covered by a social protection scheme (i.e., government or private health insurance) |
| **RRP**                                   | Report and Recommendation of the President to the Board of Directors                                                                                                                                                                                               |
| **SCADA**                                 | is a control system architecture (comprising computers, networked data communications, instruments) which allows for input data to be processed (collected, captured, transferred) and analyzed for supervisory management based on (programmable) logic to interface with process plant or machinery |
| **scheduled caste**                       | regarded as socially disadvantaged group officially enlisted in Constitution (Scheduled Castes) Order, 1950 of India, First Schedule.                                                                                                                                  |
| **Scheduled tribe**                       | synonymous to indigenous people and defined by the Constitution of India as “such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under Article 342 to be Scheduled Tribes for the purposes of the Constitution” |
| **soak pits**                             | porous-walled chambers dug up to allow the partially treated wastewater from septic tanks to slowly soak into the ground. Soak pits are also filled with brick bats / graded sand at times for filtration.                                                       |
| **surface water**                         | water located above ground and includes rivers, dams, lakes, ponds, streams, canals, and irrigation channels                                                                                                                                                        |
| **treatment block / households**          | blocks / households within project area                                                                                                                                                                                                                         |
| **tube well, bore well, hand pump, dug well** | tube well and hand pump are bore wells used for extracting ground water for drinking purpose; a bore well’s pump operated by animal, wind, electric, diesel or solar means is known as tube well; the pump operated manually or mechanically to lift ground water is known as hand pump; dug wells have a head wall built around the well with concrete drainage platform, a drainage channel, and a bucket with hand pump or windlass. |
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Measuring the Impact of West Bengal Drinking Water Sector Improvement Project
A Baseline Study

Access to safe drinking water is a fundamental right of people. The West Bengal Drinking Water Sector Improvement Project is assisting the Government of West Bengal to provide safe, sustainable, and inclusive drinking water services to over 1.65 million people in the arsenic, fluoride, and salinity-affected areas of Bankura, North and South 24 Parganas, and Purba Medinipur districts. This publication sets the baseline of the project by providing the benchmark comparison of primary outcomes for the project and non-project households, before implementation, so that an impact evaluation can be carried out at project completion.

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