MEASURING THE IMPACT OF WEST BENGAL DRINKING WATER SECTOR IMPROVEMENT PROJECT A BASELINE STUDY

*Aniceto C. Orbeta, Neeta Pokhrel, Saswati Ghosh Belliappa, Saugata Dasgupta,
and Arati Nandi*

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ABBREVIATIONS

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.

Water fetched from roadside government hand pump, South 24 Parganas (photo by ABAR Conseil Private Limited).

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

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.⁴ 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*.⁵

Women compelled to draw water from contaminated hand pump (photo by ABAR Conseil Private Limited).

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).⁶ 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).⁷ 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.

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*

	Project		Non-Project		Total	
District	<i>Gram Panchayats</i>	Households	<i>Gram Panchayats</i>	Households	<i>Gram Panchayats</i>	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. Total	Mean Project	Obs. Project	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 old	0.192	8,362	0.189	4,259	0.194	4,103	-0.006	-0.664	0.507
65 years old and over	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	-0.015	-1.530	0.126
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. Total	Mean Project	Obs. Project	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	-0.012	-0.598	0.550
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 over	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		

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.⁸ 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.

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
<i>Type of house</i>									
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
<i>Type of cooking fuel used</i>									
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.

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 *nalas* are included in the Surface Water category. These are untreated water sources.

Interview using tablet (photo from ABAR Conseil Private Limited).

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.

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 (76/1.2/1). 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 *nalas* (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									
Drinking									
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 ^a	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 pump ^b	0.341	2,010	0.276	1,008	0.407	1,002	-0.131	-6.269	0.000
Private hand pump ^c	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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Table 6 continued

Variable	Mean Total	Obs. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. 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 hand pump	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 hand pump	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. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. Non-Project	Diff.	T-Val.	P-Val.
Dug well	0.019	643	0.033	360	0.000	283	0.033	3.119	0.002
Surface	0.633	643	0.578	360	0.703	283	-0.125	-3.297	0.001
Bottled (supply mode)	0.002	643	0.003	360	0.000	283	0.003	0.886	0.376
Public hand pump	0.034	643	0.025	360	0.046	283	-0.021	-1.450	0.148
Private hand pump	0.191	643	0.219	360	0.155	283	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. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. Non-Project	Diff.	T-Val.	P-Val.
Drinking									
Good	0.645	547	0.651	355	0.635	192	0.015	0.356	0.722
Fair	0.307	547	0.313	355	0.297	192	0.016	0.382	0.703
Poor	0.048	547	0.037	355	0.068	192	-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. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. Non-Project	Diff.	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. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. Non-Project	Diff.	T-Val.	P-Val.
Drinking	2.068	812	2.298	490	1.717	322	0.581	1.295	0.196
Handwashing	1.473	778	1.611	457	1.277	321	0.333	0.731	0.465
Cooking	1.831	793	1.925	469	1.694	324	0.231	0.510	0.610
Toilet	1.053	617	1.263	334	0.806	283	0.458	0.818	0.413
Gardening	0.130	461	0.217	235	0.040	226	0.177	2.358	0.019
Other domestic uses	1.084	595	1.355	321	0.766	274	0.589	1.014	0.311
Livestock	0.369	488	0.482	255	0.245	233	0.238	2.018	0.044

Diff. = difference, Educ. = education, 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

Typical house of a below-the-poverty-line household. Storing water in open vessels in Purba Medinipur (photo from ABAR Conseil Private Limited).

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

45. 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 tank	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.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

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.¹³

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									
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									
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 pit ^a	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).

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 2018.¹⁴ The focus group discussion held among the women respondents and the accredited social health activist¹⁵ 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).

Table 18: Health Outcomes

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	-0.832	-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 grassroots 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

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.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.

C.11 Education Outcomes

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.

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 Bhargar II block, South 24 Parganas; and Indpur, Fulmoti, Lachhmanpur, Ramchandrapur, Purba Nabasan, Gelia, Deshrakoalpara of Indpur, Taldangra, Gangajalghati, Mejhia, 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									
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									
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

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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.

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.

Table 23: Productive Work and Income

Variable	Mean Total	Obs. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. Non-Project	Diff.	T-Val.	P-Val.
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

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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	1509	343.819	1,451	-10.748	-1.662	0.097
Cash payment, male, daily equivalent (₹)	345.337	2,740	338.753	1397	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 2014–2015.¹⁹ 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 cost²⁰ (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.

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.

Table 24: Expenditures

Variable	Mean Total	Obs. Total	Mean Project	Obs. Project	Mean Non-Project	Obs. Non-Project	Diff.	T-Val.	P-Val.
Total expenditure, monthly	8,233.29	2,010	8,854.02	1,007	7,610.08	1,003	1,243.93	2.794	0.005
Share									
Food	0.539	2,010	0.520	1,007	0.557	1,003	-0.036	-5.552	0.000
Non-food	0.461	2,010	0.480	1,007	0.443	1,003	0.036	5.552	0.000
Education	0.055	2,010	0.055	1,007	0.055	1,003	0.000	0.142	0.887
Health	0.056	2,010	0.065	1,007	0.047	1,003	0.018	5.053	0.000
Water	0.004	2,010	0.003	1,007	0.005	1,003	-0.001	-1.592	0.111
Beverage and tobacco	0.015	2,010	0.013	1,007	0.017	1,003	-0.004	-4.244	0.000
Clothing	0.080	2,010	0.087	1,007	0.073	1,003	0.013	4.673	0.000
Fuel and light	0.050	2,010	0.047	1,007	0.053	1,003	-0.006	-3.817	0.000
Transportation and communication	0.070	2,010	0.066	1,007	0.073	1,003	-0.006	-2.823	0.005
Entertainment	0.015	2,010	0.014	1,007	0.016	1,003	-0.002	-2.448	0.014
Housing repairs	0.018	2,010	0.025	1,007	0.010	1,003	0.014	3.952	0.000
House rent	0.000	2,010	0.000	1,007	0.000	1,003	0.000	1.411	0.158
Others	0.099	2,010	0.104	1,007	0.095	1,003	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.²¹ 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

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.

Members of self-help group during consultations with baseline study surveyors engaged by ADB (photo by Amit Verma).

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%).

82. 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.

83. 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.²³ 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

84. 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

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).

APPENDIX 1

Baseline Survey Questionnaire

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:			
		Name	Code/Number
	HI2A. DISTRICT		
	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)			
		Name	Code
	HI9. Enumerator		
	HI10. Supervisor		
	HI11. Data encoder (In office)		

Questionnaire Check Date: ____/____/____

Line Number	Name of HH members Name Last name, First name Please put in line 1 the household head (Write also first names in col HH2 of Pages 3- 8)	DEMOGRAPHIC DATA (All household members)				EDUCATION (For all HH Members)	EDUCATION (ED) (For 6 years up to 17 years)				What is the main reason for absence (See code for reason of absence) ED4	What is the main reason for not attending school) (see code below) ED5
		What is (NAME) relationship to household head (see codes below) HH3	Is (NAME) male or female 1-Male 2-Female HH4	What is (NAME) age (completed years) HH5	What is (NAME) marital status (see codes below) HH6		Which community does HoH belong to? (see codes below) HH8	What is the highest standard / year of school (NAME) completed (see codes below) HH9	Is (NAME) still attending school? 1- Yes 2-No (Skip to ED5)	What standard / year is (NAME) attending? (See code below) ED2		
HH1	HH2	HH3	HH4	HH5	HH6	HH8	HH9	ED1	ED2	ED3	ED4	ED5
01												
02												
03												
04												
05												
06												
07												
08												
09												
10												

Code of rel. to household head (HH3)

- 01-Head
02-Wife or husband of head
03-Son or daughter
04-Son-in law or daughter-in-law
05-Grandchild
06-Parent
07-Parent-in law
08-Brother or sister
09-Brother-in-law or sister-in-law
10-Nephew or niece
11-Other relative
12-Adopted/foster/stepchild
13-Domestic servant
14-Not related
98-Don't Know

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
98-Don't know

Code for Community (HH8)

- 1 - Gen
2 - SC
3 - ST
4 - OBC
5 - Other minority

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-BE/B.tech/MBBS
10-Child/Less than 6 years old attending ICDS/KG
96-Others
98-Don't know

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-Illness in the family
10-Take care of siblings
11-Severe weather
12-Festivals
96-Others (specify)-----
98-Don't know

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 farm/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-Got married
15-Did not get admission
96-Other reasons (specify)
98-Don't know

Health (HE) 1 (Do not ask for the household members who are continuously living in other town or abroad over the last two months or more)												
If yes in HE1-1												
Line Number	Has (NAME) had diarrhea/dysentery in the past four weeks? 1-Yes 2-No (Next member, or next section for last member) 98-Don't know	How many times per day during the episode?	Was there blood in the stools? 1-Yes 2-No 98-Don't know	Did (NAME) vomited? 1-Yes 2-No 98-Don't know	Did (NAME) also have fever? 1-Yes 2-No 98-Don't know	Did (NAME) had abdominal cramps/fever? 1-Yes 2-No 98-Don't know	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)	Did (NAME) seek advice or treatment? 1-Yes 2-No (Skip to HE1-12)	If yes, where did (NAME) seek advice or treatment? (see codes below)	How much did you spend for the treatment? Rs.	If no (in HE1-9), why not seek advice / treatment? (see codes below)
HH1	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 in private capacity
 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.

[illegible]

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 enterprise in the past week? 1-Yes 2-No (Skip to MW11)	If yes in MW1					If not					
			What is (NAME) type of work performed (spent most time) 1-Agriculture 2-Allied Agriculture 3 - HH Industry 4 - Non-agr (Day labor) 5 - Family business 6 - Own business 7 - Others 8 - Private sector job 9 - Govt. sector job	What is (NAME) nature of main employment? (See codes below)	What is (NAME) institutional sector of employment? (See codes below)	How is (NAME) paid in this job? 1-Daily basis 2-Long term basis 3-Contract, piece-rate 4-Monthly basis 5 - Not paid	How much did (NAME) get in cash per day equivalent for this job? MW6	How much is the value of payment in kind (NAME) get per day equivalent for this job? MW7	How many hours in a week does (NAME) usually spend in this job? MW8	If (NAME) has an enterprise, how many employees? (including family members and hired) (00 if none or have no enterprise) MW9	Average number of hours per week an employee is engaged? (00, if not employees)** MW10	Did (NAME) look for work during the past 7 days? 1-Yes 2-No MW11	What is the main reason for not looking for job (If 'no' in MW11) or not working (If 'yes' in MW11)? (See codes below) MW12
HH1	HH2	MW1	MW2	MW3	MW4	MW5	MW6	MW7	MW8	MW9	MW10	MW11	MW12
01													
02													
03													
04													
05													
06													
07													
08													
09													
10													

** (Please add up with homework (HW9) to determine the plausibility of total hours spent in home and market work against total available hours of 168 per week)

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 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)_____

SANITATION FACILITIES AND PRACTICES (SP)	
SP1	<p>What kind of toilet facility do members of your household usually use?</p> <p>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</p> <p>if 11, Skip to SP5</p>
SP2	<p>Is it for your own use or shared with other households?</p> <p>1- Own use 2- Shared</p>
SP3	<p>Do you/family members follow healthy habits after coming from toilet?</p> <p>1-Washing hands with soap/cleansing materials 2-Washing hands without soap 3-Cleaning toilet 3- Changing clothes 4-Bathing 5-Any other</p>
SP 4	<p>Are you connected to a sanitary system for liquid wastes?</p> <p>1-Underground drains 2-Open drains 3-Soak pit 4-No 98-Don't know</p>
SP 5	<p>Have any of your children missed school due to lack of poor toilet facilities</p> <p>1-Yes, indicate line number in roster 2-No (School has facility) 3-Don't have school going children 96-Other (specify)_____</p>
SP 6	<p>Has any family member attended hygiene and sanitation education sessions?</p> <p>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)</p>
SP 7	<p>Who attended these sessions?</p> <p>1-Adult male 2-Adult female 3-School going boy 4-School going girl</p>

HOUSING CHARACTERISTIC AND ASSETS (HC)		To be noted by Enumerator by observation		
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		
HC 2	How many rooms do you have? ----	3. Either roof or wall or floor – any of these of permanent materials and rest of temporary materials		
		HC 3 Garden: 1=yes 2=no		
		HC 4 Separate kitchen: 1=yes 2=no		
HC 3	Fuel used:	Code: 1-Cow dung, firewood, dry leaves 2- Kerosene oil 3-Coal 4-Biogas 5-LPG		
HC 4	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**	No. of Households*	Prop. to Total	No. of Sample GPs	Code-Adjusted Sample GPs	Total No. of Sample Households
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)=(7)*30*2
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.

APPENDIX 3

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 2015–2016.¹ 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)² 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.

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 0.10σ , 0.15σ , and 0.20σ 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 0.10σ 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 para2.
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-‘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

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. Chief 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 ☐ Others ☐ Double Storey Building		
	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 ☐ Others ☐ Roof Tank				
	Poverty Mapping:	☐ BPL ☐ None ☐ APL				
	Measure of Social Vulnerability	☐ SC ☐ OBC ☐ ST ☐ General				
	Measure of Social Vulnerability – part II	☐ Differently Abled Persons ☐ Single Elderly Man ☐ Women Headed HH ☐ Orphan Child ☐ Single Elderly Woman ☐ 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
<p>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.)</p> <p>Surveyor will receive receipt for submission when using app version (e.g., by receiving email, same as surveyor ID).</p>						

BPL = below poverty line, GP = gram panchayat, HH =household.

GLOSSARY

<i>accredited social health activist (ASHA)</i>	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
<i>below poverty line (BPL)</i>	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
<i>block or community development block (CD Block)</i>	a rural area administratively earmarked for development, consisting of several <i>gram panchayats</i>
<i>comparison block / households</i>	matching blocks / households outside project area
<i>gram panchayat</i>	an elected local administrative unit at village- or small-town level in line with local self-governance system formalized under Panchayati Raj Institution
<i>household</i>	a group of persons who normally live together and take food from a common kitchen
<i>leach pit</i>	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
<i>on-site sanitation</i>	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
<i>other backward class (OBC)</i>	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

<i>out-of-pocket expenditure</i>	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)
<i>RRP</i>	Report and Recommendation of the President to the Board of Directors
<i>SCADA</i>	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
<i>scheduled caste</i>	regarded as socially disadvantaged group officially enlisted in <i>Constitution (Scheduled Castes) Order, 1950 of India, First Schedule</i> .
<i>Scheduled tribe</i>	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"
<i>soak pits</i>	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.
<i>surface water</i>	water located above ground and includes rivers, dams, lakes, ponds, streams, canals, and irrigation channels
<i>treatment block / households</i>	blocks / households within project area
<i>tube well, bore well, hand pump, dug well</i>	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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