Project Completion Report 2014-2015

Implementation of Water Safety Plan (WSP) in Five Pourashavas

- Rajbari Pourashava
- Satkhira Pourashava
- Chuadanga Pourashava
- Kushtia Pourashava
- Manikganj Pourashava

World Health Organization
Country Office for Bangladesh

Acronyms and Abbreviations

DPHE - Department of Public Health Engineering, Bangladesh

IRP - Iron Removal Plant

PTW - Production Tube Well

PWSS - Pourashava Water Supply Section

TLCC - Town Level Coordination Committee

WSP - Water Safety Plan

WSS - Water Supply System

WHO - World Health Organization

Executive Summary

The AusAid-WHO Water Quality Partnership for Health, under the completed Phases 1 and 2, has been instrumental in initiating capacity building in support of WSP in a number of countries, including Bangladesh, in the WHO South-East Asia and Western Pacific regions. The Partnership is continued with further support in Bangladesh under the Phase 3 where with support from WHO, Department of Public Health Engineering (DPHE) decided to implement WSP in other five Pourashavas, which are Rajbari, Kushtia, Chuadanga, Manikganj and Satkhira Pourashavas. The overall objective of the assignment was to support these five Pourashavas to be able to supply safe water to the consumers through implementation of full scale WSP and to integrate WSP into the regular management system of Pourashava water supply systems.

WSP implementation in the above mentioned five Pourashavas, started in February 2014, was guided by the steering committee from central level consisting of DPHE and WHO officials, and was closely managed by Executive Engineers of DPHE at district level. Trainings were provided to DPHE engineers and Pourashava Water Supply Section staff on WSP, and water quality testing to develop experts at local level. The Pourashava top authority was made involved in different stages of the process which made events like awareness campaigning, exposure visits, document preparation workshops, review workshops etc. effective in these Pourashavas.

WSP implementation has resulted in some noticeable improvements in the water supply systems of these Pourashavas in a short period. The awareness raising events and improvement actions taken by the Pourashavas have improved consciousness among both users and PWSS staff. The documented WSP was one of the effective outcomes from this assignment. The WSP documents prepared for these five Pourashavas will help the Pourashavas in prioritizing interventions that are needed to ensure supply of adequate safe water gain the confidence of users. The systematic approach suggested in the WSP would help PWSS staff to gradually overcome the limitations that often drive them to compromise with water quality.

From the comparison made under this assignment between baseline condition and the condition after WSP implementation for this short period in five Pourashavas, it can be said that the Pourashavas have gained substantial momentum in the field of revenue collection, in their understanding of water supply system and hazard/hazardous events etc. Apart from that, the practice of water quality testing at their own laboratory would eventually help them monitoring the quality of supplied water regularly. The improvement actions being carried out by PWSS and DPHE, selected in light of the WSP for each Pourashava, would also help to promote the practice of adopting pro-active approach while working. A follow up programme will help in ensuring the long term sustainability of WSPs.

One of the major outcomes of this assignment was the improved understanding and relationships among DPHE and PWSS staff, and the collaborative approach throughout the project period. Since the WSP approach was not very familiar to all the staff at the beginning of the programme, the local level trainings, meetings, awareness raising events and progress monitoring activities have created an environment for PWSS to seek technical knowledge on management of the water supply systems through WSP. Overall, the program was able to motivate the PWSS staff and the Pourashava authorities to continue with the WSP onwards, which would contribute to improvement of water quality as well as would help to gain better participation from authority and users in these Pourashavas as far as water supply is concerned.

Table of Contents

Chapter 1: Introduction

1.1 Project Background

Access to safe drinking water is an effective means of promoting good health and reducing poverty. World Health Organization (WHO) guidelines for Drinking Water Quality (2004) recommended implementation of Water Safety Plan (WSP) as a cost-effective, management-oriented, preventive approach to ensure drinking water safety. The AusAid-WHO Water Quality Partnership for Health, under the completed Phases 1 and 2, has been instrumental in initiating capacity building in support of WSP in a number of countries, including Bangladesh, in the WHO South East Asia and Western Pacific regions. The Partnership is continued with further support in Bangladesh and other countries under the Phase 3.

Building on the achievements of Phases 1 and 2, the Phase 3 of the Partnership focused on mainstreaming of WSP so that they become standard Operation and Maintenance practice for water supply. One of the strategies to achieve the goal was to facilitate the Pourashavas in full scale implementation of WSP. In Phase 2, the water safety plans were developed for the water supply systems of 12 Pourashavas in Bangladesh, which were prioritized initially for full scale WSP implementation by the national WSP steering committee. Out of these 12 Pourashavas, in the first year, WSP was implemented in five Pourashavas, and then Department of Public Health Engineering (DPHE), Bangladesh planned to implement WSP in another five Pourashavas which are Rajbari, Kushtia, Chuadanga, Manikganj and Satkhira Pourashava.

1.2 Project Objectives

The overall objective of the assignment was to support Pourashava authorities in five selected Pourashavas to be able to supply safe water to the consumers through implementation of full scale WSP and integrating WSP into the regular management system of Pourashava water supply system.

More specifically, the assignment was carried out with the following objectives:

a. To enhance capacity of the water works for monitoring and preventive maintenance of the water supply systems;
b. Promote and motivate the consumers to practice safe water handling and improved hygiene in their daily life; and
c. To establish a mechanism for regular advocacy and monitoring of the roles of the Pourashavas and consumers.

1.3 Organization of the Report

This report is prepared to summarize the activities that have been carried out under Phase -3 of this project in five Pourashavas of Bangladesh; Rajbari, Kushtia, Chuadanga, Manikganj and Satkhira Pourashava. The report consists five chapters where this chapter provides short introduction on the project background and project objectives. Chapter 2 discusses the WSP implementation works that have been carried out in Pourashavas by DPHE and Pourashava jointly. Chapter 3 discusses the WSP documentation in all five Pourashavas including the water supply system profiles. Chapter 4 summarizes the impact of WSP through comparison of some indicators used for assessment of WSP in Pourashavas, along with the improvement works carried out by DPHE and Pourashavas. Finally Chapter 5 has some recommendations for WSP implementation in water supply systems in future.

Chapter 2: Implementation of WSP in Pourashavas

2.1 Initiatives at Central Level

A Preparatory Meeting on WSP, held on April 2, 2015 at Training Division of DPHE was arranged to begin the WSP implementation in five Pourashavas. The Participants of this meeting were Executive Engineers from the district level of DPHE and Executive Engineer/Assistant Engineer (Water) of five Pourashavas (Chuadanga, Manikganj, Kushtia, Rajbari and Satkhira). The agenda of this meeting was to inform DPHE (district level) and Pourashavas about this project, as well as to discuss the activities of this project in brief. Relevant DPHE officials and WHO personnel were also present in these meetings and gave briefings on these agenda.

A training of trainers (TOT) was arranged from 6-8 May 2014, at ITN-BUET where two representative from each DPHE district office (Executive Engineer and Assistant Engineer/ Sub-Assistant Engineer) and two representative from the Pourashavas (Chuadanga, Manikganj, Kushtia, Rajbari and Satkhira) were invited. The aim of this three day long training program was to build local resource persons on WSP so that they can carry out WSP training for municipal water supply staff at local level. Another workshop was held from 13-14 August, 2014 at Training Division, DPHE Bhaban on 'Orientation on Water Safety Plan'. Executive Engineers of DPHE from district level and other staff working in this project from Pourashavas were present to discuss the work plan and strategies to implement WSP in respective Pourashavas. master trainers from DPHE and WHO jointly facilitated the workshop for the participants. From central level, Programme Director, Programme Manager and WHO officials were also present there to share their views on this project and expectations on outcomes of this project.

A Workshop on Operator's Manual was arranged where some IEC materials developed on WSP was reviewed. To discuss the feedback on Operator's Manual, a meeting was arranged on 7th December, 2014 at DPHE-WHO Meeting room where the progress of field level activities were also discussed. Apart from that, two exposure visits were arranged under this project to provide the opportunity to exchange ideas among the WSS staff, share field experiences, and discuss future plans to continue WSP in their systems. Water supply staff from all five Pourashavas, and DPHE and WHO officials participated in these visits. First exposure visit was held at Manikganj Pourashava WSS on December 8, 2014, and the second exposure visit was held at Rajbari Pourashava WSS on May 28, 2015.

Water quality monitoring is a major part of operation and maintenance in WSP. But most of the Pourashavas do not have water quality test kits to monitor the quality of the water they supply. Therefore, a training program was arranged to train Executive Engineer and Assistant Engineer (Water) from each Pourashava on use of water quality test kits. In this training program, the participants were trained on use of these test kits and were told to train minimum two

municipal staff on water sampling, testing, reporting etc. in their Pourashavas. It was discussed in the training program that a laboratory will be set up at Pourashava office for water quality testing. Later, the portable water quality test kits were handed over to the Pourashavas.

To monitor the progress of WSP implementation in five Pourashavas, two progress review meetings were arranged on 26th February, 2015 and 7th May, 2015. To monitor the progress of the project at field level, several field visits were made by DPHE engineers, including Superintending Engineer, Ground Water Circle, DPHE as well as WHO programme personnel in the Pourashavas.

Moreover, various IEC/BCC materials were developed and used under this project. The major materials are as below:

- Let Us Know How To Keep Water Safe (Manual)
- Technical Guideline on Water Safety Plan Implementation for Water Supply Operators
- Guideline on Water Safety Plan Implementation for Educational Institutions
- Guideline on Water Safety Plan Implementation for Hospitals and Clinics
- Water Safety Plan - Flip Chart
- Banner

2.2 Implementation at Pourashava Level

Implementation of WSP in all five Pourashavas at field level started through an inception workshop with the Pourashava authorities, the Pourashava Water Supply Section (PWSS) staff and other relevant stakeholders. The workshop was followed by a knowledge, attitude and practice (KAP) survey for the target communities to analyze the situation in the Pourashavas regarding water supply. The survey covered different aspects of WSP including status of communication and collaboration among stakeholders, their knowledge, understanding (including roles and responsibilities), perceptions and attitudes; system infrastructure and its operation and maintenance procedures; cost savings, cost recovery, financial support and investment; service level, water quality and customer satisfaction; incidence of water-related illness and attendance at school (ref: outcome and impact indicators) etc.

Based on the findings from the surveys and the inception workshops, the developed WSP for the water supply system of the Pourashavas were reviewed and finalized through consultative workshops and were further reviewed by experts. The PWSS staff were provided training on how to implement WSP at field level through workshops, exposure visits and practical works so that they can implement the finalized WSP.

The consumers are always an integral part of WSP with specific roles and responsibilities. Under this assignment, DPHE prioritized awareness raising and media campaigning to sensitize the

residents of Pourashavas, who have been using the water supplied by Pourashava WSS, about the importance of safe water for healthy living, and to make them aware about their responsibilities as a consumer. In this regard, along with many other events, the town level coordination committee (TLCC) was made instrumental in carrying out advocacy and monitoring of such actions through orientation sessions.

Under the overall guidance of the Programme Manager, Water, Sanitation and Healthy Settings, the programme has been implemented in all five Pourashavas, where the Executive Engineers of DPHE at district level supervised the activities closely. DPHE engaged one technical staff exclusively for WSP at the central level for progress monitoring and carrying out required day to day activities at the central level. Two professionals from WHO also provided technical support to the programme.

2.3 Formation of Pourashava WSP Team

The top authority of each Pourashava was committed to engage relevant staff of Council to implement Water Safety Plan in Pourashavas, and to provide necessary support continuously. In this respect, a statement of such commitment was duly signed by Mayor of each Pourashava, and was circulated as a declaration among concerned staff and stakeholders. The statement was also included in the citizen charters of the Pourashavas.

The WSP team of each Pourashava consists of several members ranging from 8 to 12 in number, and including the Mayor of the Pourashava as Chairman/Adviser. Other members of the team were selected through discussion among Pourashava and DPHE staff. In addition to Executive Engineer-Pourashava, Executive Engineer-DPHE, Assistant Engineer (Water)-Pourashava and Assistant Engineer-DPHE, other members were included in the team from Sub-Assistant Engineer-DPHE, Sanitary Inspector, Ward Councilors, Local Journalists, Urban Planner, Slum Development Officer, and other key persons who could play an important role to WSP implementation in Pourashavas.

There are four types of members in the WSP team; Chairman of the team, WSP team coordinator, Member Secretary and Member. Each type of member in the team has been assigned different roles and responsibilities. The members of WSP team in each Pourashava have set few common objectives for the team, which was approved by the Mayor, as follows.

- Regular checking of WSP implementation and its functional integrity in different steps
- Regular checking of the progress of Improvement Plan
- Regular (e.g. quarterly) checking of Operational Monitoring activities
- Preparation and regular checking of annual report on WSP and impact of WSP
- Ensuring implementation of the decisions taken by WSP team in meetings

- Monitoring of actions taken by PWSS to implement WSP
- Facilitation of awareness raising program for consumers on safe water
- Encouraging all consumers to pay water bill regularly
- Campaigning to increase number of water connections/consumers
- Active participation in development of WSP each year

2.4 Inception Workshops

The WSP implementation activities in the Pourashavas started through an inception workshop in August, 2014 in presence of WSP Team Members, DPHE representatives and Pourashava key personnel. The main objective of this Inception Workshop was to aware WSP team, Pourashava authority, TLCC members and all other stakeholders about the implementation of Water Safety Plan in the Pourashavas. During the inception workshops, commitment from Mayor, key personnel and stakeholders were sought to cooperate to WSP implementation in relative Pourashavas. The participants of the workshops were Mayor, Ward Councilors, DPHE officials, Pourashava officials, PWSS staff and all members of the WSP team. The work plan for WSP implementation was shared in the workshops and feedback from participants were collected. Few of the suggested changes in the workshops were noticed and taken into consideration by WSP team.

Figure 2.1: Inception workshop in Rajbari (left) and Manikganj (right) Pourashavas

2.5 Awareness Programs

A team was mobilized for awareness campaigning activities in July, 2014 after the signing of the agreement between DPHE and the Pourashavas. Since consumer awareness on safe water system and hygiene practice is a major part in implementation of WSP, different types of

initiatives were taken in all the Pourashavas to raise consumer awareness and to promote hygiene practice.

2.5.1 Mike announcement: Mike announcement in Pourashavas was carried out in two stages. Messages related to hygienic practice of use of water and importance of safe water for healthy living were announced. The initiatives taken by Pourashava to improve the state of water supply system through WSP was also shared with people through these messages.

2.5.2 Leaflet Distribution: Around 5,000 leaflets were printed for distribution in each of the Pourashava. The leaflets were distributed in all the wards of the Pourashavas. Few leaflets were distributed by Mayor and Councilors in different meetings. These leaflets were also distributed in TLCC meetings, and awareness raising sessions where participants gathered to learn about WSP.

2.5.3 Print and Electronic Media: Information about WSP in the Poursahavas were published in newspapers, and the local Cable Television Channel was used for publicizing the key WSP messages.

2.5.4 Display Boards and Banners: Several display boards with key WSP messages were mounted at different points of the Pourashavas. Two large size digital banners on WSP concept have been mounted at strategic locations of each of the five Pourashavas. The main objective of installing these boards is to spread the key messages of Water Safety Plan among each and every person of the Pourashavas.

Figure 2.2: Display boards and bill boards in Pourashavas

2.5.5 Meeting Sessions with Consumers

TLCC Meeting: TLCC meetings, a meeting being regularly organized by Pourashavas where Mayor, Ward Councilors, Executive Engineer from Pourahava and DPHE, relevant Pourashava staff and representatives of other stakeholders participate, were utilized to disseminate the messages and processes of WSP in the Pourashavas. The key discussion points of the session included, but were not limited to - what is safe water and its importance, what is WSP, how

WSP will be implemented, necessity of WSP in the Pourashava, roles & responsibilities of TLCC for implementation of WSP, how the communities can help implementation of WSP, water quality, personal hygiene practice etc.

Ward Level Sessions: Ward level WSP orientation sessions were organized in all the wards of the Pourashavas where Ward Councilors of each ward lead these sessions. The points discussed in the sessions were same as for TLCC meetings.

Women Group Session: Women group WSP orientation sessions were arranged where the woman Ward Councilors lead these sessions. The key points discussed in these session are - what is safe water and its importance, what is WSP, necessity of WSP in the Pourashava, how the communities can help implementation of WSP, water quality, personal hygiene practice etc.

Imam Session: Imam session was organized where Imams from major mosques of the Pourashavas attended to discuss the key points and messages of WSP.

Users Level Session: Above mentioned points were also discussed with users living in slums and low-income communitites. The participants were mainly women and children in these sessions. During these sessions, importance of hygienic practice during use of water was prioritized.

Courtyard Meeting: Several courtyard WSP meetings were organized in all the wards of the Pourashavas, where mainly women and youth were the majority of the participants. The Pourashava Mayor and other relevant staff of PWSS attended most of these sessions where the WSP relevant issues were discussed.

Figure 2.3: Awareness campaigning sessions in Chuadanga (left) and Rajbari (right) Pourashavas

2.6 Situation Analysis Survey

A survey was conducted to gather information on perception of consumers of supplied water, and related knowledge, attitude and practice in the project area. A questionnaire was

developed containing questions to collect information on socioeconomic status of respondents, health & education, water source, storage, hygiene etc. A day long orientation program on the prepared questionnaire and its filling techniques was conducted for the surveyors. The door to door survey was carried out by experienced local surveyors. Around 10% of total consumers in the Pourashavas were covered under the survey.

The local dialect of the area was used for convenience of the respondents while collection of information. District level staff of DPHE monitored the progress of the survey works closely and collaborated with the surveyors as and when required. Finally the collected survey data were compiled to analyze the knowledge, attitude and practice of local users. Some of the findings from the survey are briefly discussed below.

The users were asked how frequently they clean their underground reservoirs and overhead tanks properly. The results in Figure 2.4 indicate that most of the users (more than 90% in all five Pourashavas) clean their containers used for collection/storage of water each time before use. But frequency of cleaning underground tank is very low in Satkhira Pourashava (only 1% clean theeir underground tanks at least once in 6 months). Also frequency of cleaning the overhead tanks in Satkhira Pourashava is comparatively low to other Pourashavas (less than 50% users clean at least once in 6 months). The results of all five Pourashavas can be found in Figure 2.4.

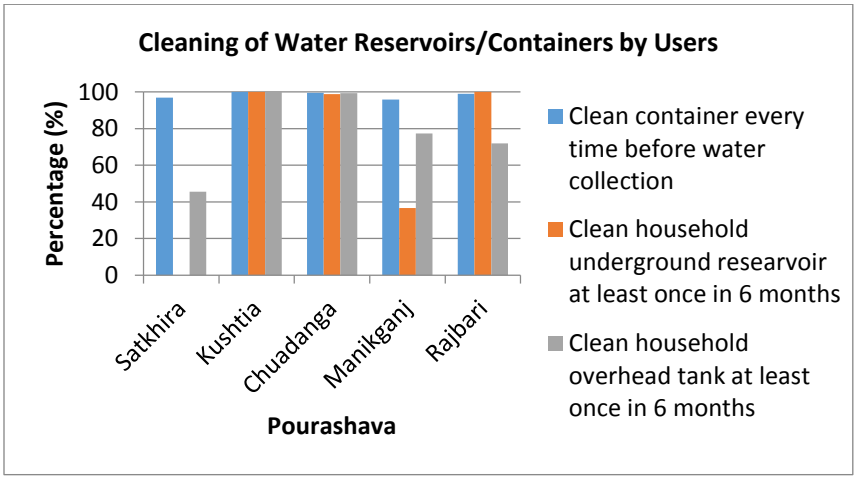

Figure 2.4: Percentage of users who clean their water reservoirs/containers before use

While cleaning the containers, use of water from deep/shallow tube well was found more than other sources in general. In Kushtia Pourashava, piped water is used more (by more than 75% users) for cleaning the containers than other four Pourashavas. Deep/shallow tube well is most used in Rajbari Pourashava (by more than 60% users) for cleaning water containers. For dish washing, piped water supply is preferred in most of the Pourashavas and water from tube well is used as the second preference, except Manikganj where deep/shallow tube well (38%) and river/pond water (44%) is preferred to other sources for dish washing. The results from the

survey on source of water for water reservoir cleaning and dish washing in all five Pourashavas are shown in Figure 2.5.

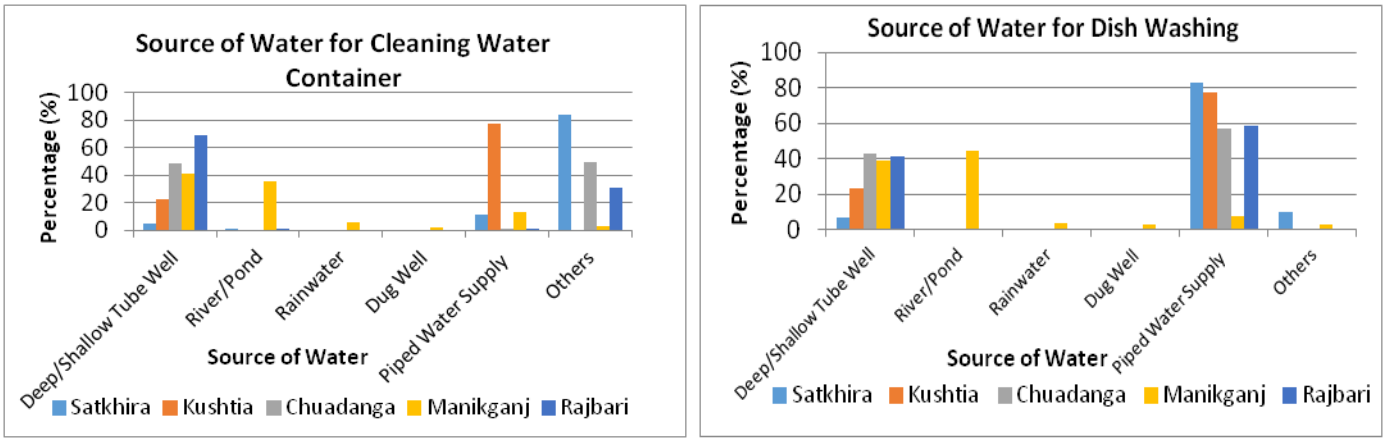

Figure 2.5: Source of water in Pourashavas for cleaning water container and dish washing

The respondents were also asked about washing hands before preparing food, where a large number of respondents in each Pourashava replied that they use only water for washing hand before taking/preparing food. 76% respondents in Satkhira Pourashava use only water to wash their hands before preparing food whereas in Rajbari Pourashava 70% respondents said that they use soap. The results are shown in Figure 2.6.

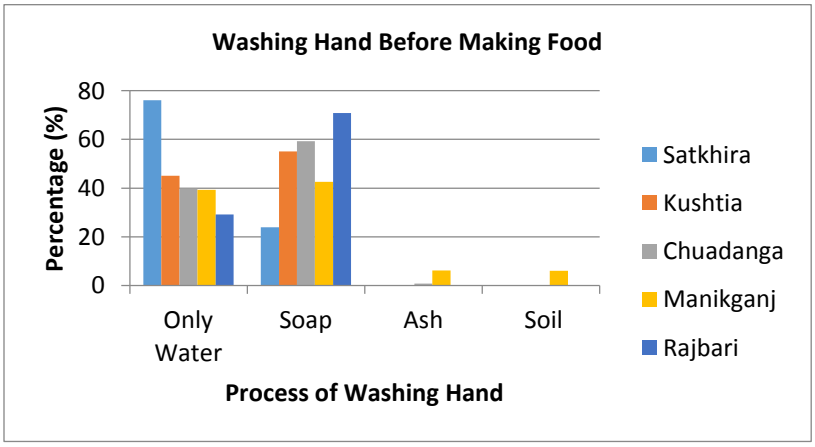

Figure 2.6: Percentage of users wash hands before taking food and what they use for washing hands

The major sources of drinking water for all five Pourashavas are Deep/Shallow Tube Well and Pourashava supplied piped water. In Chuadanga, Khushtia and Rajbari Pourashavas, Tube Wells are prime source of drinking water, whereas Satkhira and Manikganj Pourashavas largely depend on Pourashava supplied piped water. The percentage of using deep/shallow tube well for drinking is highest in Rajbari Pourashava (95%) and percentage of using piped water is highest in Manikganj Pourashava (96%). The sources of drinking water in all five Pourashavas are shown in Figure 2.7.

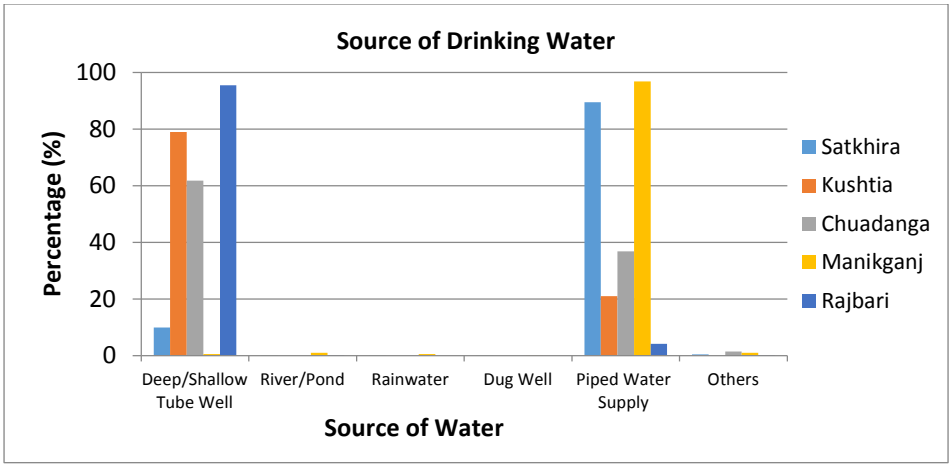

Figure 2.7: Sources of drinking water in five Pourashavas

Most of the users use some sort of treatment system to treat water before drinking in the Pourashavas. In Satkhira, filter system is very popular (used by 95% respondents), which is also used in other Pourashavas in varying extent. Boiling method is more used Chuadanga Pourashava (63%) than others. Alum and water purifying tablets are also used as treatment methods in few households in Manikganj (5%) and Rajbari (3%) Pourashavas respectively. The results are shown in Figure 2.8.

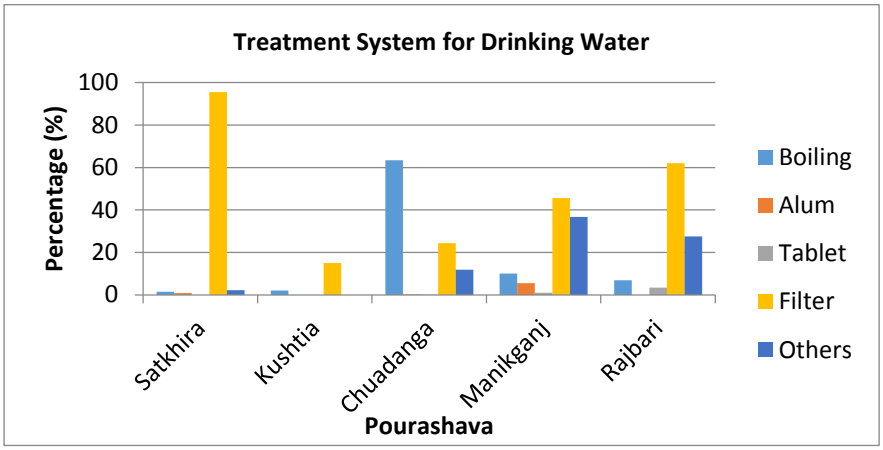

Figure 2.8: Treatment systems used for drinking water at households in Pourashavas

Overall, the satisfaction level on Pourashava water supply system is very low (1%) in Satkhira although the use of this water for drinking is very high (second highest; 89%) in this Pourashava. The satisfaction level is high in Kushtia and Manikganj Pourashavas (81% and 79% respectively). Rajbari and Chuadanga Pourashava show low satisfaction level of the consumers on their Pourashava water supply systems. The results of satisfaction of consumers on Pourashava water supply systems are shown in Figure 2.9.

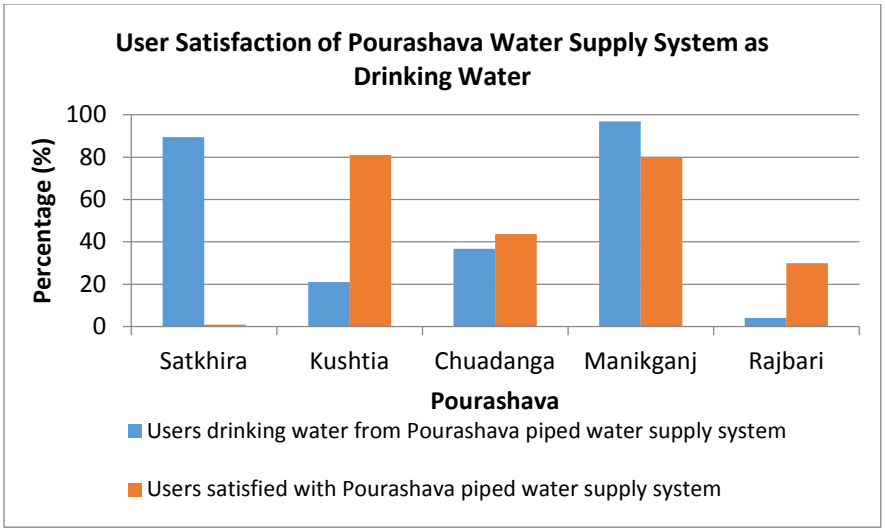

Figure 2.9: Satisfaction of users on Pourashava water supply systems in five Pourashavas

2.7 WSP Document Preparation Workshop

A consultant team, with support from DPHE engineers, developed five WSP documents for water supply systems of five Pourashavas. The key processes used to develop the document are - physical observation of each step of existing water supply systems, collecting sanitary inspection results, a workshop where the draft WSP was prepared, and finally a review workshop where feedback from PWSS staff were collected on the developed WSP.

Based on the physical observation, collected data/information, and workshop outputs, WSP for each Pourashava has been prepared where identification of potential hazardous events for each Pourashava, risk assessment for identified hazards, identification of existing control measures, and risk reassessment after existing control measure were carried out and documented. Moreover, corrective actions and improvement plans for identified hazards were identified collectively by PWSS staff, with technical assistance from experts.

The WSP documents also include an operational monitoring plan as well as verification monitoring plan to facilitate effective implementation of WSP at field level for each Pourashava. The supporting programs needed to implement the plans have also been identified in this document. At the end of the report, monitoring log sheets for all relevant staff of the PWSS were included that would help keeping records of WSP implementation in each Pourashava.

Figure 2.10: Workshop in Rajbari (left) and field visit in Satkhira (right) for WSP documentation

The prepared WSP document was again reviewed in a 'Review Workshop' that was arranged by DPHE-Rajbari where selected staff from all the Pourashavas were invited. In the two day-long review workshop, the WSP documents for each Pourashava were reviewed by respective Pourashava staff. The monitoring log-sheets were also reviewed and feedback were collected from Pourashavas, and later corrections were made in the documents accordingly. At the end of the review workshop, an exposure visit was facilitated by Rajbari PWSS for all participants.

Figure 2.11: Review workshop (left) and exposure visit by all five PWSS staff (right) in Rajbari

2.8 Sanitary Inspection

Sanitary inspection for the water supply system in each of the five Pourashavas were carried out. The average risk score and comparison among risk scores of five Pourashavas for Production Wells, Pump Houses, Overhead Tank(s) and Distribution Lines are shown in Figure 2.12. The results show that sanitary scores for Satkhira Pourashava WSS is higher than all four Pourashavas at productions tube well, pump house, overhead tank and distribution lines.

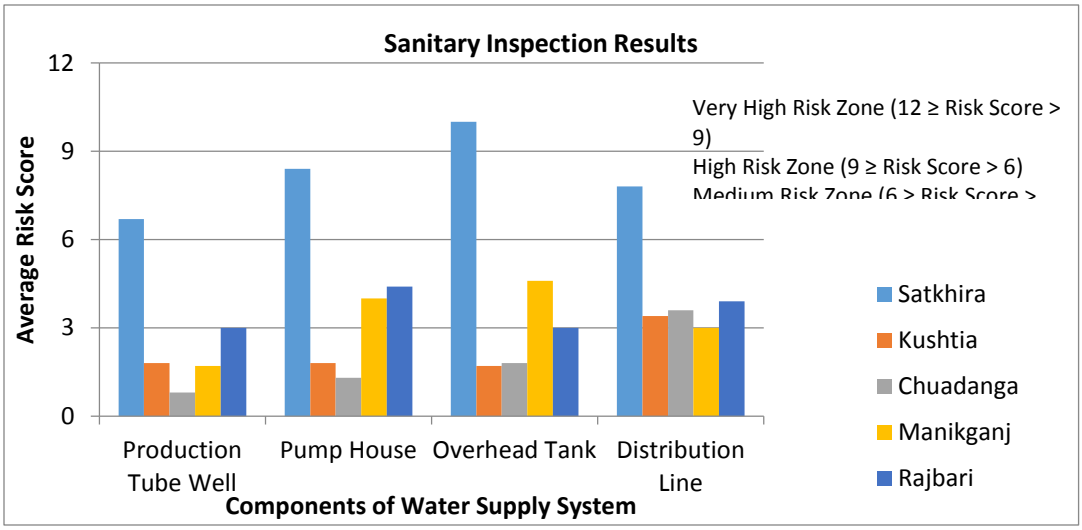

Figure 2.12: Sanitary inspection results of five Pourashavas

2.9 Water Quality Test

DPHE also facilitated collection of samples from different points of water supply systems of all five Pourashavas and testing of those samples at DPHE central/zonal laboratory. Apart from that, DPHE engineers trained local PWSS staff on how to use portable test kits to test water samples in the Pourashava laboratory, which has also been set up by DPHE.

Figure 2.13: Water quality testing laboratory at Chuadanga (left) and Rajbari (right) Pourashavas

2.10 Improvement Actions

Based on the WSP document prepared for each Pourashava, DPHE and PWSS jointly undertook improvement actions e.g. sluice valve repair, pipe line leakage, wash out system activation, treatment plant maintenance etc. The improvement actions are summarized in Chapter 4 of this report.

Chapter 3: WSP Documentation and Action Plans

For documentation of Water Safety Plan for all five Pourashavas, information on Water Supply System of the Pourashavas were collected by the consultant team through following steps:

1) Physical observation of each step of existing water supply system with support from PWSS staff, DPHE and WSP team members.
2) Collection of sanitary inspection results, which was carried out by PWSS staff and DPHE.
3) Collection of survey results conducted at household level.
4) Finally, a workshop was held in presence of PWSS staff, WSP team and DPHE, which was facilitated by resource person from DPHE.

The WSP documents consist of the findings from several field visits, hazard analysis, operational monitoring plan, required corrective action plans, improvement plans, verification plans, and required supporting programs to implement the WSP for respective Pourashavas, along with other findings and information.

3.1 Pourashava Water Supply Systems

After several field visits, and collection of required information from PWSS and DPHE, water supply system profile and flow diagram were prepared for each Pourashava. Based on the flow diagram and WSS profile, hazard analysis was done for the Poursahavas.

3.1.1 Rajbari Pourashava Water Supply System

The Rajbari Pourashava water supply system has five active production tube wells (PTW) that are operating at the depth from 300-450 ft. Out of five PTW, two are connected to the only Iron Removal Plant (IRP) and other three PTW supply water without any treatment. After aeration-coagulation/flocculation-sedimentation-filtration processes in the Iron Removal Plant (IRP), water is supplied to consumers through transmission-distribution network. No chlorination process is used in the treatment system. There is one overhead tank with capacity of 355 m^3. Water is supplied on average for 5 hours per day to 1,640 connections (1,606 residential and 34 commercial).

3.1.2 Kushtia Pourashava Water Supply System

The Kushtia Pourashava water supply system has 14 active production tube wells (PTW) that are operating at the depth from 215-360 ft. Out of these 14 PTW, six are connected to three Iron Removal Plants (IRP) and other eight PTW supply water without any treatment. After aeration-filtration processes in Iron Removal Plants (IRP), water is supplied to consumers through transmission-distribution network. No chlorination process is used in the treatment

system. There are three overhead tanks in the system, each with capacity of 680 m^3. Water is supplied on average for 6 hours per day during April to June, and for 5 hours per day during July to March for 6,877 connections (6,703 residential, 139 commercial and 35 street water stand posts).

3.1.3 Chuadanga Pourashava Water Supply System

The Chuadanga Pourashava water supply system has nine active production tube wells (PTW) that are operating at the depth from 300-450 ft. In the water supply system of this Pourashava, there is no treatment plant and water is supplied without any chlorination. There are three overhead tanks in the system, each with capacity of 400 m^3. Water is supplied on average for 5.5 hours per day to 5,927 connections (5,766 residential, 150 commercial and 11 street water stand posts) except for winter, when water supply is reduced to 5 hours per day.

3.1.4 Satkhira Pourashava Water Supply System

The Satkhira Pourashava water supply system has 13 active production tube wells (PTW) that are operating at the depth from 94-105 m. Out of these 13 PTW, eight are connected to two Iron Removal Plants (IRP) and other five PTW supply water without any treatment. After aeration-filtration processes in Iron Removal Plants (IRP), water is supplied to consumers through transmission-distribution network. No chlorination process is used in the treatment system. There are two overhead tanks in the system, with capacity of 680 and 450 m^3. Water is supplied on average for 15 hours per day for 8,115 connections (7,804 residential, 184 commercial and 127 street water stand posts).

3.1.5 Manikganj Pourashava Water Supply System

The Manikganj Pourashava water supply system has seven active production tube wells (PTW) that are operating at the depth from 280-350 ft. The PTW are connected to the only Iron Removal Plant (IRP). After aeration-filtration processes in Iron Removal Plant (IRP), water is supplied to consumers through transmission-distribution network. No chlorination process is used in the treatment system. There is one overhead tank in the system with capacity of 450 m^3. Water is supplied on average for 20 hours per day for 4,985 connections (4,849 residential, 129 commercial and 7 street water stand posts), where 2 hours of supply is received by each connection.

3.2 Hazard Identification and Risk Analysis

All hazard and hazardous events that could result in the water supply being or becoming contaminated, compromised or interrupted were identified. All potential biological, physical and chemical hazards associated with each step and/or hazardous events in the drinking-water

supply than can affect the safety of water were identified. The hazardous events were mainly identified under following steps of the water supply system:

- Source (Groundwater)
- Production Tube Well and Pump House
- Treatment Plant
- Reservoirs (Clear Water Reservoir and Overhead Tank)
- Transmission and Distribution Lines
- House Connection and Households

Each identified hazard was assigned a risk score based on the "Likelihood" and "Severity" of that hazard, where semi-quantitative approach was followed.

3.3 Operational Monitoring Plan

A systematic monitoring plan is needed to convey the message to the authority that the control system or new control system for different components of water supply system are working properly. Such Operational Monitoring plans were developed for each Pourashava in presence of PWSS staff and WSP team in the documentation workshop. The following issues were considered for the Operational Monitoring plan:

1) What will be monitored?
2) How it will be monitored?
3) Where it will be monitored?
4) Who will monitor it?
5) When it will be monitored?

For each type of staff of PWSS who are assigned with different tasks, a separate Operational Monitoring log-sheet has been developed. There are separate log-sheets for Pump Operator, Treatment Plant Operator, Pipe Line Mechanic, Bill Distributor and Laboratory Assistant. For each of them, different log-sheets are prepared based on frequency of monitoring e.g. daily, weekly, monthly, 3-monthly and 6-monthly. The Operational Monitoring plan was discussed with relevant WSS staff of each Pourashava and they were shown how to fill up the log-sheets.

3.4 Corrective Action for PWSS

When the existing control measures were reported to be ineffective or not sufficient for long time in the water supply systems of the Pourashavas, the risks were recalculated in terms of likelihood and consequences taking into account the effectiveness of each control. For each

identified risk considering the existing control measure, if exists, corrective actions were recommended to minimize the risk. Some examples of corrective actions are - avoid selection of aquifers with high chemical contamination; repair sanitary seals at PTW; repair/replace non-return valves, flow meters, pressure valves if damaged; install protection system around the treatment plant; manual chlorination as long as mechanized system is not installed, use of rubber gasket and pipe drilling device during providing house connection etc.

3.5 Improvement Plans and Supporting Programs

Improvement action plan is the action plan for new (future) operational controls or any other improvements in the water supply system. In the WSP for each Pourashava, long-term action plans that would need time and substantial amount of resource were considered in improvement action plan. Some examples of improvement action plans considered for the Pourshavas are:

- Construction of Iron Removal Plant (IRP) for PTW that are not connected with IRP.
- Installation of chlorine dosing machine in the water supply systems.
- Replacement of old pipe lines in transmission and distribution lines, that have either too many leakages or substantially reduced in diameter, with new pipe line networks.
- Construction of pump houses for PTW that do not have any pump house to protect the PTW from contamination.
- Replacement of all old turbine pumps with new submersible pumps.

Few supporting programs were considered in the WSP to complement the regular operation monitoring activities as well as to raise awareness among the consumers on water safety. There were also some training events proposed in the WSP for capacity building of PWSS staff e.g. training on chlorination system, alum dosing, using rubber gasket and pipe cutter during providing house connection etc. Pourashavas have also provided uniform and safety equipment for convenience of workers.

3.6 Verification Plans

Verification of all the activities planned in the WSP is very important for the success of the whole process. In the WSP for each Pourashava, a verification plan for each type of activity to be carried out by PWSS staff was documented. The Executive Engineer-Pourashava and Executive Engineer-DPHE are given the tasks of verification of WSP operational monitoring activities.

Chapter 4: Impact of WSP in Pourashavas

4.1 Impact Assessment Survey Result

Full WSP implementation takes time and some benefits will take more time than others to be fully realized, which is important to bear in mind when deciding appropriate intervals for follow-up assessment. In addition, higher quality, more fully implemented WSP is expected to yield more outcomes and impacts than those in the early stages of implementation and/or of lower quality. The implementation of WSP in five Pourashavas have had some noticeable impacts on water supply systems of these Pourashavas. To assess the changes in water supply system, some indicators were used during baseline assessment to capture the state before WSP implementation, and at the end of the project. The results of these surveys carried out to find the impact of WSP in a year time in each of the five Pourashavas are briefly discussed below.

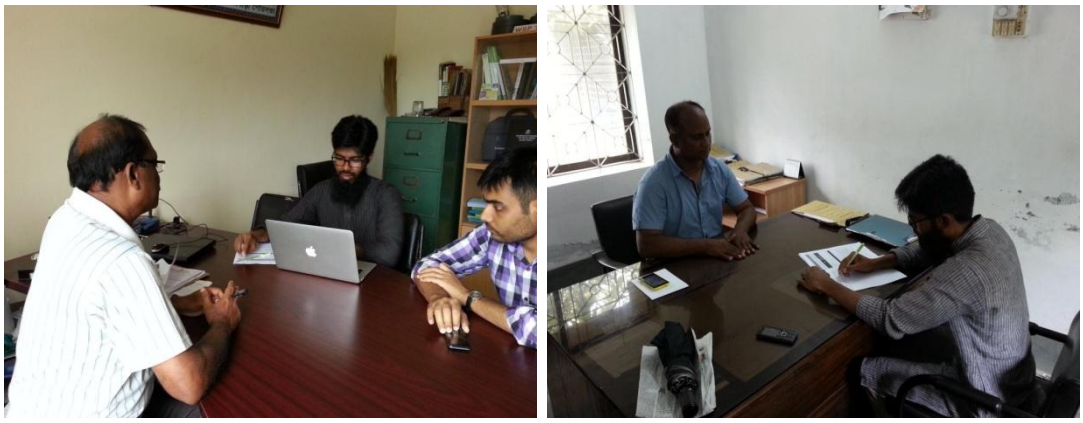

Figure 4.1: Impact assessment survey in Rajbari (left) and Manikganj (right) Pourashavas

To understand the "Level/strength of operations and management practices evident through documentation and implementation of relevant plans and procedures", eight questions were asked to Assistant Engineer (Water) of each Pourashava. During the assessment, the extent to which relevant operations and management plans and procedures have been documented, are kept current/relevant and are implemented/practiced were considered. It has been found that all the Pourashavas have gained strength through WSP implementation in their Pourashavas, where Rajbari Pourashava shows significant improvement as shown in Figure 4.2. Total strength was counted out of a scale of 40 where each of the eight questions has a maximum value of 5. Results show that Rajbari Pourashava received 22 out of 40 at the end of the period though they started with lowest possible number (8 out of 40). Other Pourashavas also improved their condition which is shown in Figure 4.2.

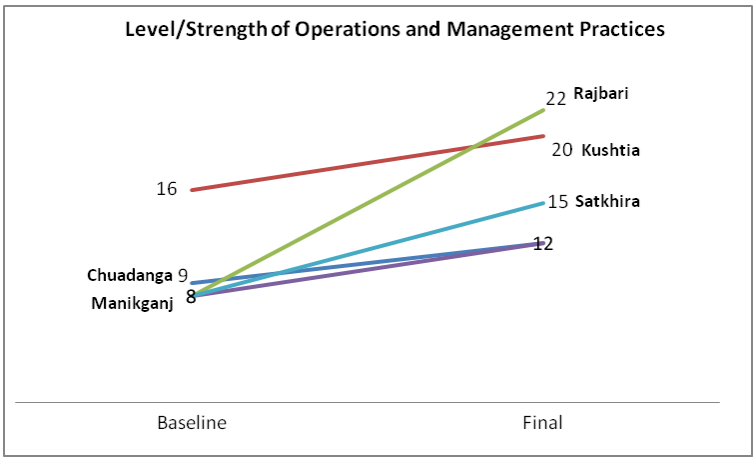

Figure 4.2: Level/strength of operations and management practices before and after WSP implementation in five Pourashavas

"Understanding of water supply system" (out of a maximum score of 25) and "understanding of the hazards and hazardous events that threaten the water supply system" were assessed for baseline condition and at the end of WSP implementation. The questions were aimed at knowledge assessment/testing of appropriate persons within the water supplier, including those with responsibility to protect or manage water quality within the catchment, water treatment plant (WTP) and the distribution system. The results are shown in Figure 4.3, from where it can be said that all Pourashavas have improved their understanding of WSS and hazardous events. Among five Pourashavas, Rajbari PWSS has better understanding of water supply system (21.7 out of 25) and Satkhira PWSS has better understanding of hazard/hazardous events (19).

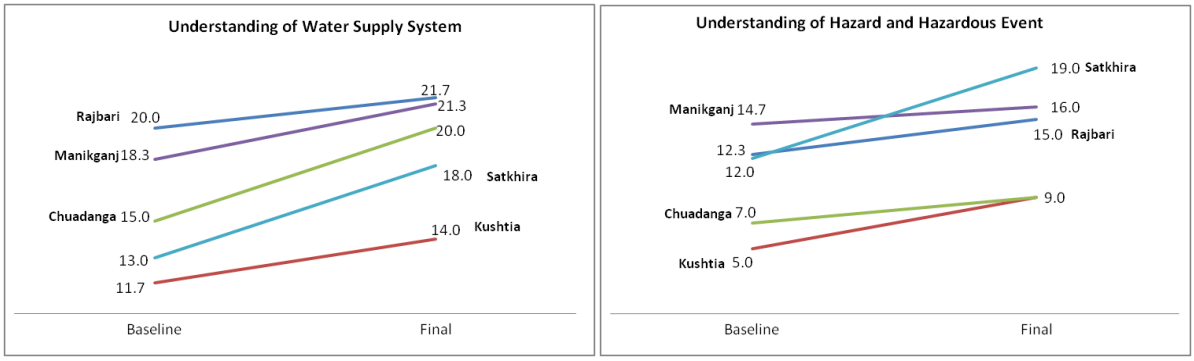

Figure 4.3: Understanding of water supply system (left)) and hazard/hazardous events (right) before and after WSP implementation in Pourashavas

The "operating cost" for per unit of water production in each Pourashava was calculated for 12 months, while for baseline condition it was calculated for the past 12 months prior to beginning of WSP in the Pourashava and for final assessment it was calculated for the period of 12 months prior to the time of data collection. Figure 4.4 shows the results, from where it can be found

that Satkhira Pourashava was able to reduce its water production cost (from BDT 5.33/m^3 to BDT 3.28/m^3) significantly, while the cost increased for Manikganj and Rajbari Pourashavas. The operating cost is highest for Manikganj Pourashava (BDT 8.85/m^3).

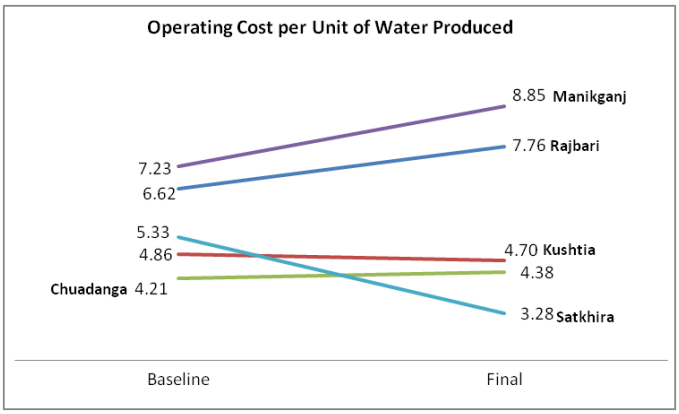

Figure 4.4: Operating cost (BDT) per m^3 of water produced in Pourashavas before and after WSP implementation

"Total revenue collected per consumer or per connection over past 12 months" and "total revenue as a percentage of total operating costs over past 12 months" were analyzed and comparison was made between baseline and final survey results. The results show that Rajbari Pourashava has made significant progress in revenue collection in this period, rising up to BDT 3,733/connection from BDT 1,254/connection in a year, whereas revenue collections have slightly decreased for Kushtia and Satkhira Pourashavas. It has been reported that because of waiving the bills for many consumers by these Pourashava, the revenue collection has decreased. Manikganj Pourashava also shows good increase in revenue collection in this period. It is also noticeable that Rajbari (101.14%), Chuadanga (109.80%) and Manikganj (101.90%) Pourashavas have their total revenue collections as percentage of their operating costs more than 100%. The overall results are shown in Figure 4.5 for all five Pourashavas.

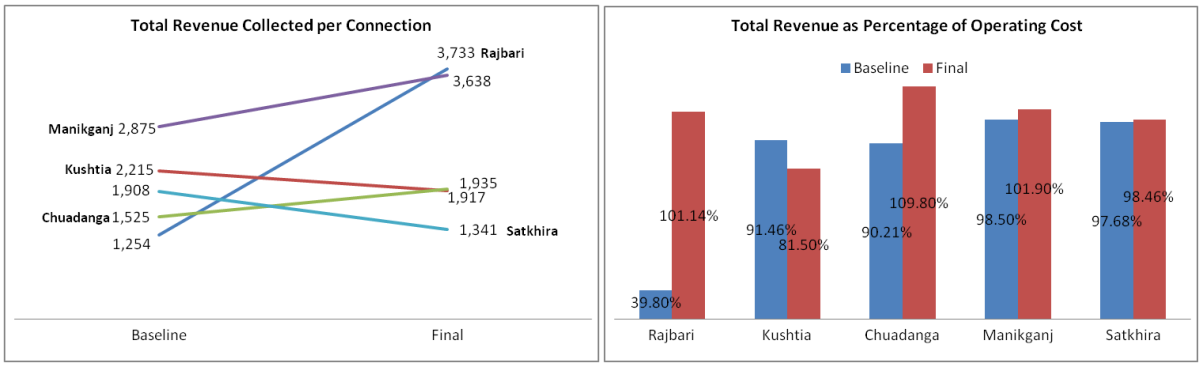

Figure 4.5: Total revenue collection (BDT) in Pourashavas before and after WSP implementation (left) and total revenue as percentage of operating cost (right)

During the WSP implementation, all Pourashavas were encouraged to keep records of consumer complaints. The results are shown in Figure 4.6 where it shows that Kushtia has recorded more complaints (810 complaints registered) with a substantial rise in numbers. The number of complaints recorded is lowest in Rajbari Pourashava (115 complaints recorded). Since the practice of registering complaints in complaint register books was not very well adopted by Pourashavas before WSP, the data does not suggest whether the system has improved than last year or not. The findings for all five Pourashavas from the survey are shown in Figure 4.6.

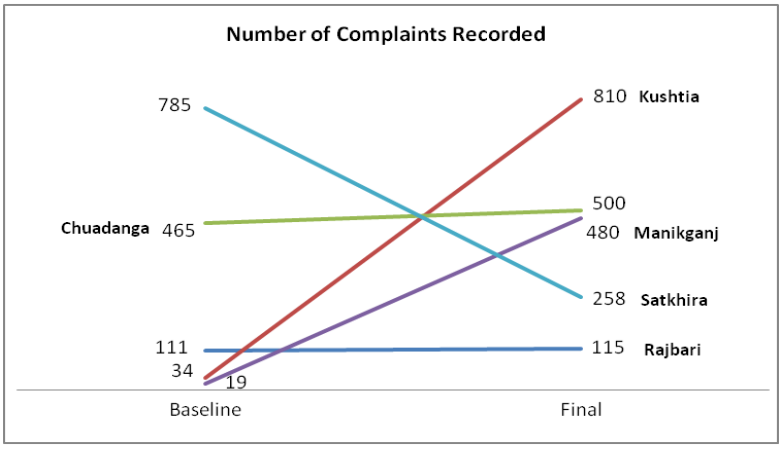

Figure 4.6: Complaints registered by PWSS staff in Pourashavas before and after WSP implementation

4.2 Improvement Actions in Pourashavas

In all five Pourashavas, the Pourashava authority and DPHE jointly undertook improvement actions which has been a direct result of WSP implementation in these Pourashavas. Some pictures of improvement actions in Pourashavas are shown from Figure 4.7 to 4.9. The list of works required, jointly prepared by DPHE and PWSS, include, but not limited to:

- Installation of new sluice valves and gate valves where needed
- Construction of chambers for new sluice valves and gate valves, and providing cover slab
- Filling of the sluice valve chambers with sand
- Increasing height of sluice valve chambers above the road/drain level
- Construction of drainage system to drain out water coming from wash out line of overhead tank, treatment plant and clear water reservoir
- Improvement of sanitary seals' condition at PTW
- Installation of chlorine dosing system in the WSS
- Using pipe drilling device and rubber gasket during providing house connection
- Cleaning of sluice valve chambers, treatment plant, overhead tank, clear water reservoir

- Improvement of wash out systems and installation of required new wash out systems
- Repairing of leakages in pipe network and providing casing pipes to protect house connections from wastewater when crossing drains

Figure 4.7: PWSS staff cleaning overhead tank (left) and newly constructed sluice valve chamber (right)

Figure 4.8: Cleaning of old sluice valve chambers (left) and repair wash out pipes (right)

Figure 4.9: Pump house and sanitary seal after cleaning/repairing (left) and use of pipe driller during providing house connection (right)

Chapter 5: Conclusion and Recommendation

5.1 Conclusion

WSP implementation in five Pourashavas under Phase -3 have resulted in some noticeable improvements in the water supply systems of the Pourashavas. The assignment, which was intended to see that the Pourashava water supply system authorities are adequately motivated and strengthened to implement water safety plan in their respective water supply systems by themselves focusing on preventive maintenance, has achieved its goal substantially in its first year. The awareness raising events and improvement actions taken by the Pourashavas have improved consciousness among both users and PWSS staff. The documented WSP was one of the effective outcomes from this assignment. It is expected that this WSP document for these five Pourashavas will be utilized in prioritizing interventions that are needed to improve the water supply systems and to gain confidence of users on these water supply systems. The systematic approach suggested in the WSP would help PWSS staff to gradually overcome the limitations too, that often drive them to compromise with water quality.

From the comparison made under this assignment between baseline condition and the condition after WSP implementation for this short period in five Pourashavas, it can be said that the Pourashavas have gained substantial momentum in the field of revenue collection, in their understanding of water supply system and hazard/hazardous events etc. Apart from that, the practice of water quality testing at their own laboratory would eventually help them monitoring the quality of supplied water regularly. The improvement actions being carried out by PWSS and DPHE, selected in light of the WSP for each Pourashava, would also help to promote the practice of adopting pro-active approach while working.

One of the major outcomes of this assignment was the improved understanding and relationships among DPHE and PWSS staff, and the collaborative approach throughout the project period. Since the WSP approach was not very familiar to all the staff at the beginning of the programme, the local level trainings, meetings, awareness raising events and progress monitoring activities have created an environment for PWSS to seek technical knowledge on management of the water supply systems through WSP. Overall, the program was able to motivate the PWSS staff and the Pourashava authorities to continue with the WSP onwards, which would contribute to improvement of water quality as well as would help to gain better participation from authority and users in these Pourashavas as far as water supply is concerned.

5.2 Recommendation

As all five Pourashavas have experienced the benefit of WSP in this short period, it is expected that they would continue to progress further through implementation of WSP beyond this programme, since all these Pourashavas have their own WSP including the action plans required. However, based on the learning of this assignment, and received feedback from PWSS and DPHE staff who were very much involved in WSP implementation in these five Pourashavas, few recommendations are made here for future consideration:

- The local level trainings should get more attention so that PWSS staff could gain a better understanding on concepts and different steps of WSP. Therefore, during the TOT and other central level trainings, mechanisms of making the local level trainings more interactive and effective should be discussed and emphasized.
- For keeping records of the WSP operational monitoring activities carried out by PWSS staff, computerized system could be adopted, which would make the analysis and monitoring of results easier. In that case, one staff could be appointed in each Pourashava to update the records in a developed format.
- Pourashavas should arrange at least one "exposure visit" per year where they would invite PWSS staff from 2/3 other Pourashavas, as the exposure visits provide opportunity to exchange ideas as well as provide incentives for PWSS staff to follow the WSP efficiently.
- As a part of awareness campaigning, education institutes (schools, colleges etc) should also be given priority along with other meetings to reach more people with the WSP messages effectively.
- Yearly follow-up monitoring program in all five Pourashavas could be planned to assess the progress of WSP by DPHE.