



## Context and Prospect of Water Safety Plans in Bangladesh

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### Abstract

Study results showed that deep tube well and shallow tube well water were used for drinking purposes by 31.43% and 24.29% respondents respectively where as minority of the respondents use other sources. Perception about the safe drinking water for the respondents was found mostly 63% among all the respondents followed by moderately safe 21%. About 54.29% respondents were found to be fully satisfied about their drinking water followed by moderately satisfied 30%. Among all the beneficiaries, 82.86% beneficiaries indicated communication materials like booklet, leaflet, poster, manuals, etc were available. This investigation found 83.33% rain water harvesting plant was in high risk where as, 66.67% deep tube well water source was in high risk category. The chances of contamination were high in the period of covering the water vessels during storage of water was 64.71%. About 89% respondents among all the official respondents did not receive the water safety plans training. About 66.67% officials responded that no sanitary inspection was done. Most of the respondents (78.57% beneficiaries and 76.19% organizational personnel) had high perception about the selected benefits of water safety plans. Among all the officials and beneficiaries that 75.71% beneficiary and 66.67% organizational personnel had high perception in selected limitations to implement the water safety plans. Finally 95.24% organizational personnel and 81.43% beneficiaries had high perception about the selected necessities to successful implementation of water safety plans in Bangladesh.

**Keywords:** Water safety, Safe drinking water, Risk management approach, Implementation plan

### Introduction

The process of implementation of water safety plans in Bangladesh with the benefits, limitations and further needs to successful implementation focus of attention has been on rural water supplies, although there has also been some experience with pourshava piped water supplies. The World Health Organization (WHO) issued the 3rd edition of their Guidelines for Drinking Water Quality in 2004 recommending that Water Safety Plans (WSPs) should be introduced in all water supplies as a key component of water safety management. The water supply sector in Bangladesh has taken this up and the major rural and small town water supply programmes have made commitments to implement water safety plans in their future programmes. For WSPs to be utilized effectively in Bangladesh, the general guidance available from WHO needed to be modified to reflect local conditions (WHO, 2004 and Davison *et al.*, 2005).

This study consolidates the experience of the development of 'model' WSPs for key rural water supply technologies and of implementing WSPs in communities by NGOs and the Department of Public Health Engineering (DPHE). Three NGOs and DPHE undertook pilot projects to implement WSPs in a number of areas in Bangladesh and for a variety of technologies (Ahmed *et al.*, 2006). In addition, the DPHE-UNICEF arsenic project has also implemented WSPs in a further 23 Upazilas (Ahmed and Jahan, 2000). In addition, the model WSPs and community monitoring tools were developed to ensure these were

appropriate to local conditions. These have been tested in communities. This experience provides the sector with an understanding as to how WSPs can be replicated at scale and the modifications that may be required for scaling up. The results and experience gained from the study will help planners, implementers and policy makers in understanding the importance of WSPs and the process steps required to implement WSPs in field conditions. It is also expected that they will also be able to realize the real benefits and the challenges of WSPs and to identify the areas where emphasis should be given. Therefore, the Purpose of the study was to detect the current situation of water safety plans that has been occurring last two years after the initiatives of WHO, 2005 in Bangladesh. As there was almost no change in safe water supply situation in those areas over last four years where the water safety plans has been implemented (NGO Forum for drinking water supply and sanitation, 2006). There are some major limitations and needs for which the water supply condition had not satisfactorily developed after implementation of the water safety plans in Bangladesh. The study helped to identify the major benefits, limitations and needs to implement the water safety plans in Bangladesh that might be checked. Hence for the above situation, context and prospect of water safety plans in Bangladesh has been identified as the study problem.

## Methodology

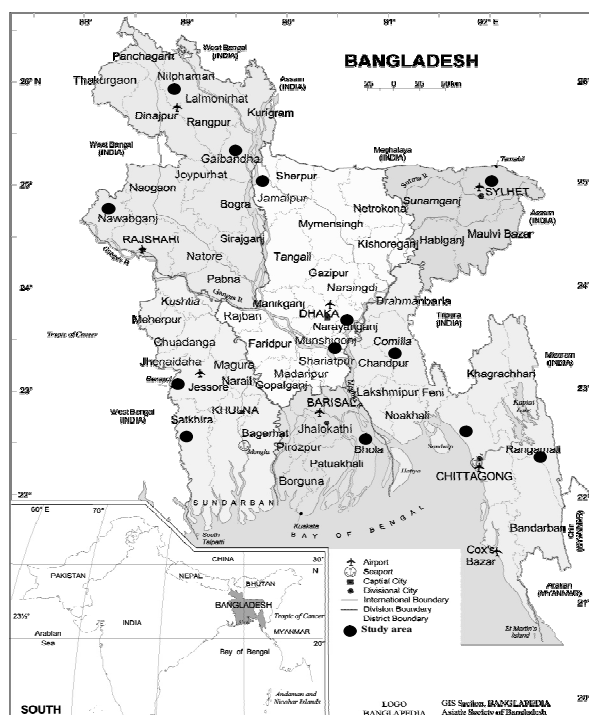
### Design of the study

In the study, two approaches have been used: (i) a statistical survey to assess the existing as well as previous water safety options in the area, and (ii) a study carried out with participation of the different peoples using participatory learning methods, check

lists of the situations at the option level to understand how the practical situation perceives the changes in supply of safe drinking water.

### Locale of the study

The study was conducted at 18 upazillas (rural and urban) of 13 districts all over the country. A short description of the 18 upazillas has been given below:



**Figure 1. Map of the study area**

### 3.4 Data collection, processing and analysis

For data collection, 13 districts were selected among a total of 26 districts where WSP is being implemented. Ten percent upazilas from the each district were selected. A total of 112 respondents both officials and beneficiaries were randomly selected from the 18 upazillas. The data obtained through interview schedule were coded and tabulated in a data sheet. In some cases, qualitative data were converted to quantitative data by means of suitable scoring to facilitate interpretation. Local units were converted into standard unit scales.

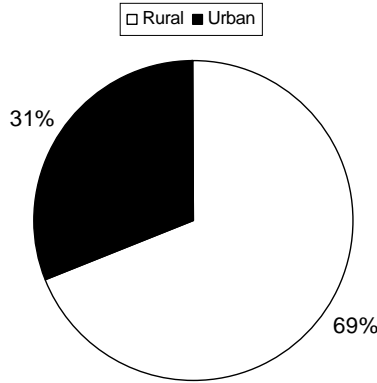
After processing, data were entered in statistical software (SPSS) for further analysis. All personal traits were categorized and arranged in simple tables

for description. The respondents were also categorized based on their perception scores. MS Excel, statistical software was also used for graphical presentation of data.

## Results and Discussion

### Area type

In the study area, 69% respondents were found to live in the rural area where as the rest 31% respondents were in urban. The result indicated that most of the water safety plans of projects were implemented in the rural areas because education and awareness level of the rural people about the safe water were low compared to the urban inhabitants.



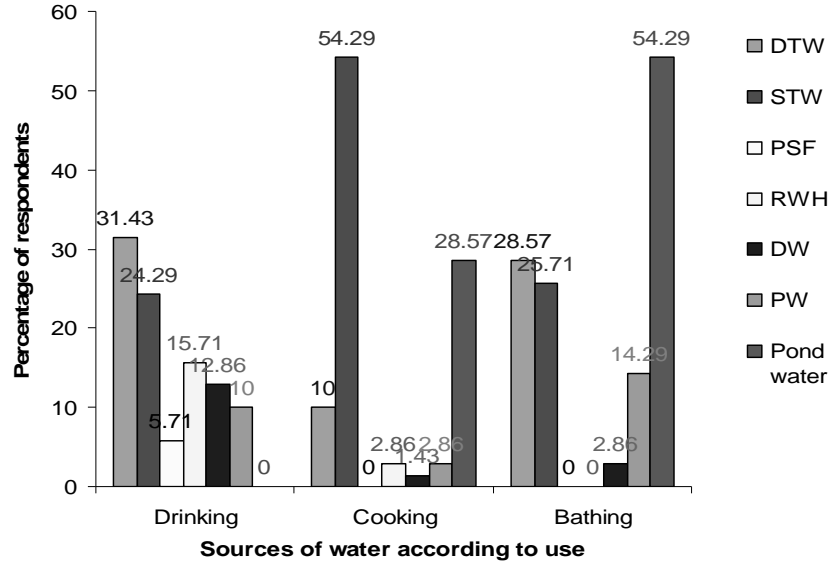
**Figure 2. Different groups of respondents according their area type**

**Source of water to use**

In case of drinking, it was found in the study area that deep tube well and shallow tube well water was used by 31.43% and 24.29% respondents where as minority of the respondents use other sources. None was found to use pond water for drinking purposes (Figure 3). On the other hand cooking was found 54.29% respondents used shallow tube well water and 28.57% respondents found was used pond water for their cooking (Figure 3). Beside these, 54.29% of the respondents used the pond water for their bathing

purpose followed 28.57% deep tube well water and 25.71% shallow tube well water respectively . None was found to use pond sand filter and rain water harvesting for their bathing.

In Bangladesh most of the drinking water sources were DTW. Beside this the study indicated that STW, RWH and pipe water supply were increasing day by day after the WSP project implementation. No one use the pond water for their drinking purposed mentioned the awareness rising about the water safety.



Note: DTW= Deep tube well, STW= Shallow Tube well, PSF= pond Sand Filter, RWH= Rain Water Harvesting, DW= Dug well, PW= Pipe water.

**Figure 3. Different sources of water**

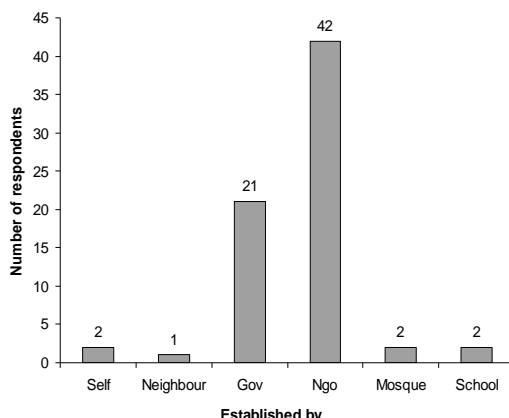
**Establishment of water source**

Among all the respondents, 60% of the respondents indicate that majority of the water options were established by the NGOs in their area followed by

government establishment 30% (Figure 4). Normally majority of the water option was established by the government but in this study it was found NGOs as because Water Safety plans were engaged all sorts of

the study. So different NGOs were implemented water safety plan project only newly established water options. In the study, drinking water sources were mostly established by the NGOs rather than government as because the study area were the WSP project implemented area where different alternative

sources were existed like pond sand filter, rain water harvesting, dug well, shallow tube. This result did not show at the total drinking water source established in Bangladesh performed Bangladeshi government greater than NGOs.



Note: Gov= Government, NGO=Non Government Organization.

**Figure 4. Establishment of water sources by the different organization**

**Arsenic condition**

Most of the respondents about 58.58% responded that their drinking water source was totally arsenic free where as 30% responded that they did not know (Table 4.2). In Bangladesh both of government and NGOs organizations were so much aware about the

arsenic but in my study showed that about 30% respondent don't know as because lack of educational condition of the people in the study area and also indicated that after the implementation of WSP project no change showed at the awareness rising level.

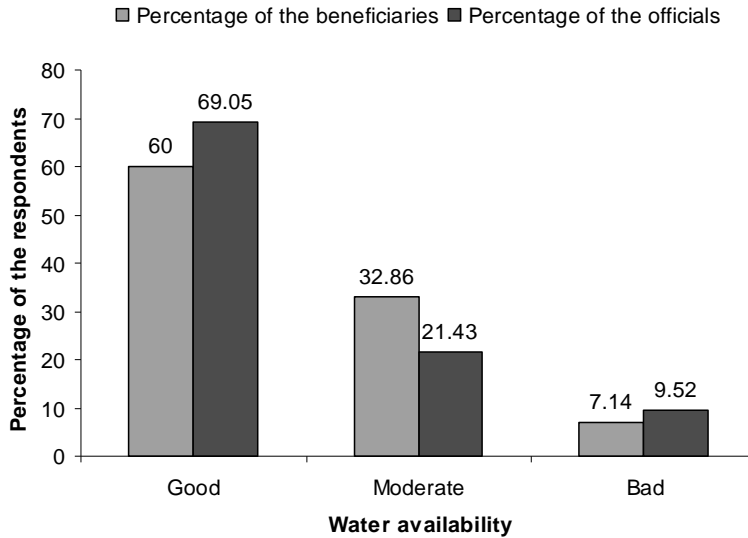
**Table 1 Arsenic condition in the study area as response by beneficiaries**

| Characteristics   | Categories (Scores) | Number of respondents | Distribution of respondents (%) |
|-------------------|---------------------|-----------------------|---------------------------------|
| Arsenic condition | Arsenic positive    | 8                     | 11.43                           |
|                   | Arsenic free        | 41                    | 58.58                           |
|                   | Don't know          | 21                    | 30                              |

**Availability of drinking water**

In this study, most of the respondents about 60% were found to say their water availability was good where as different organization were said it was 69.05%. About 32.86% of the total beneficiaries and 21.43 %

respondents of the officials responded moderate availability of water around their area. The both official and beneficiaries responded bad 9.52% and 7.14% respectively (Figure 5).

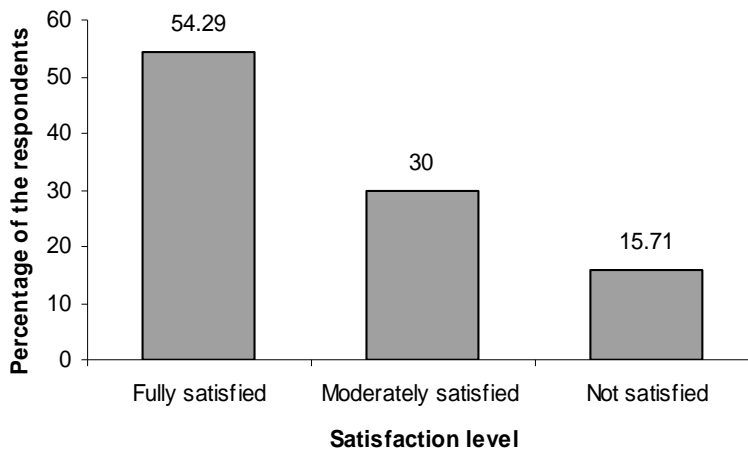


**Figure 5. Availability of water in the study area**

**Satisfaction about the drinking water**

Among all the respondents, about 54.29% respondents were found to be fully satisfied about their drinking water followed by moderately satisfied 30% and the rest was found not satisfied 15.71%

(Figure 6). Majority was found satisfied as because they only consider the taste of water not include other things and beside this the lack of knowledge about the water related diseases.



**Figure 6. Satisfaction level of the respondents to drinking water**

**Risk assessment**

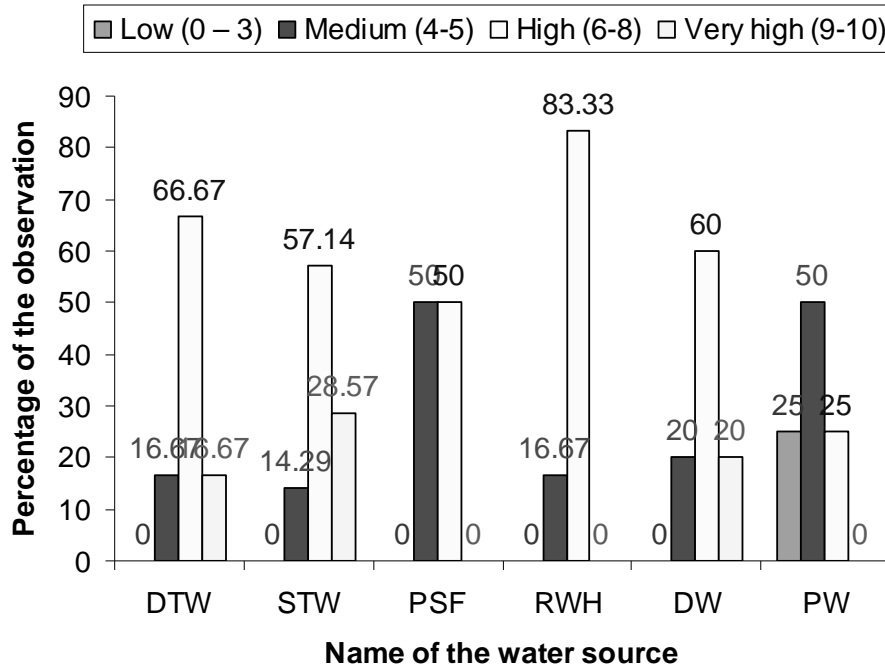
**Assessment of risk sanitary scoring for the water source site**

The different water sources were categorized for the risk assessment into four categories namely; low (0-3), Medium (4-6), high (8-6) and very high (9-10). The results showed that for 66.66% the deep tube was high in risk, shallow tube well 57.14%, pond sand filter 50%, rain water harvesting 16.67%, dug well 60% and pipe water supply 50% in the same category (Figure 7). This investigation was found

majority of the rain water harvesting was in high risk 83.33% followed by deep tube well 66.67%. This scoring method might have been influenced by the factors related to the risks of contamination, lack of corrective/management actions, and/or difficulties in controlling the observed hazards at the catchments and/or options sites as suggested by the sanitary inspection forms.

The sanitary scoring indicated that the drinking water sources specially DTW, STW is in high risk but earlier most of the people said water is safe. This

result indicated that the people were not aware about the water safety by the implementation of water safety plans.



**Figure 7. Risk assessments by sanitary scoring for the water source site**

Note: DTW= Deep tube well, STW= Shallow Tube well, PSF= pond Sand Filter, RWH= Rain Water Harvesting, DW= Dug well, PW= Pipe water

**Assessment of risk sanitary scoring for the water collection and transportation part**

Water collection and transport is important to assess the risk of water contamination. The result was clearly showed the chances of contamination was high in the period of covering the water vessels during storage of water about 64.71% followed by keeping water vessels in safe or high place at home 55.88%, contact of cloths with water during transportation (41.18%) and use of cover on water vessels during transportation (35.29%).

This result indicated that awareness raising activities by the NGOs is good but the total safety of drinking water is less considered by the WSP project. The study also indicated that the WSP project was failed to achieve the WSP primary goals.

**Assessment of risk sanitary scoring for the water storage part**

Water storage is so important to assess the risk of water recontamination. The result (Table 3) was clearly showed the chances of contamination was

very low in the period of handling the water at home 11.76% and about 35.29% respondents disinfect the water during storage. The investigation showed the needs of disinfection of the drinking water during storage at home.

**Opinion about the water safety plans monitoring**

In this study, 100% official responses were found for conducting the continuous monitoring. The result (Table 4) was indicated that the 57.14% monitoring was conducted by the NGOs and rest 42.86% was conducted by the government. About thirty six percent monitoring was done within 15 days interval followed by 33.33% monthly and 21.43% half yearly based (Table 4). In case of visual monitoring 73.81% official respondents were said yes and the rest were not. In case of water quality test 57.76% respondents were responded positive and the rest 45.24% were negative for the lack of laboratory facility (Table 4). The most important part of water safety plans monitoring were hygiene monitoring during handling the water specially collection and storage of drinking water but in this section the results were showed

78.57% respondents were indicated negative impression (Table 4). 66.67% officials were responded that no sanitary inspection was done.

The study represented that water quality monitoring was not improved after the WSP project implementation

**Table 2. Sanitary scoring for the Water collection and transport part**

| Characteristics                             | Categories (Scores)                            |     | Number of respondents | Distribution of respondents (%) |
|---|--|-----|-----------------------|---------------------------------|
| Water collection and transport part         | Cleaning vessel by soap/ash                    | Yes | 13                    | 38.24                           |
|   |  | No  | 21                    | 67.76                           |
|   | Contact of dirty hand with collected water     | Yes | 21                    | 61.76                           |
|   |  | No  | 13                    | 38.24                           |
|   | Use of cover on vessel at transportation       | Yes | 12                    | 35.29                           |
|   |  | No  | 22                    | 64.71                           |
|   | Contact of cloths with water at transportation | Yes | 14                    | 41.18                           |
|   |  | No  | 20                    | 58.82                           |
| Keeping vessel in safe / high place at home | Yes  | 19  | 55.88                 |                                 |
|   | No   | 15  | 44.12                 |                                 |
| Covering vessel during storage of water     | Yes  | 22  | 64.71                 |                                 |
|   | No   | 12  | 35.29                 |                                 |

**Table 3 Sanitary scoring for the water storage part**

| Characteristics    | Categories (Scores)         |     | Number of respondents | Distribution of respondents (%) |
|--------------------|-----------------------------|-----|-----------------------|---------------------------------|
| Water storage part | Contact of hands during use | Yes | 4                     | 11.76                           |
|                    |                             | No  | 30                    | 88.24                           |
|                    | Disinfection                | Yes | 12                    | 35.29                           |
|                    |                             | No  | 22                    | 64.71                           |

**Benefits of water safety plans**

The respondents’ perceptions were tested on the basis of analysis of selected 3 benefits. In this session the respondents’ perception are analyzed for interpretation and understanding chronologically. Firstly, the distribution of the respondents was done based on their perception against each of the 3 statements i.e., the benefits as well as the overall perception regarding the benefits to implement water safety plans.

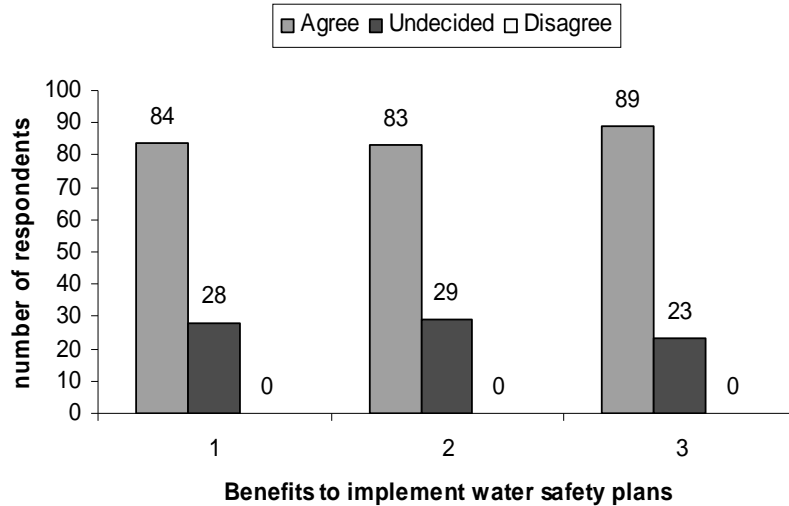
It is very difficult to determine the perception of an individual regarding anything because perception varies from individual to individual. Same thing could be perceived differently/different ways by different individual. However, the respondents were asked to express their perception by indicating agreement against each of the selected 3 statements related to benefits to implement water safety plans and based on the agreements (opinions), the respondents were distributed in different agreement categories.

**Table 4 Water safety plans monitoring**

| Characteristics     | Categories (Scores)                |             | Number of respondents | Distribution of respondents (%) |
|---------------------|------------------------------------|-------------|-----------------------|---------------------------------|
| Motoring            | Monitoring being done              | Yes         | 42                    | 100                             |
|                     |                                    | No          | 0                     | 0                               |
|                     |                                    | Total       | 42                    | 100                             |
|                     | Providing organization             | GoB         | 18                    | 42.86                           |
|                     |                                    | NGO         | 24                    | 57.14                           |
|                     |                                    | Total       | 42                    | 100                             |
|                     | Interval of monitoring             | Daily       | 0                     | 0                               |
|                     |                                    | Weekly      | 4                     | 9.52                            |
|                     |                                    | 15 days     | 15                    | 35.71                           |
|                     |                                    | Monthly     | 14                    | 33.33                           |
|                     |                                    | Half yearly | 9                     | 21.43                           |
|                     |                                    | Total       | 42                    | 100                             |
|                     | Visual monitoring                  | Yes         | 31                    | 73.81                           |
|                     |                                    | No          | 11                    | 26.19                           |
|                     |                                    | Total       | 42                    | 100                             |
|                     | Laboratory test of water           | Yes         | 23                    | 57.76                           |
|                     |                                    | No          | 19                    | 45.24                           |
|                     |                                    | Total       | 42                    | 100                             |
|                     | Observation of water safety in use | Yes         | 11                    | 26.19                           |
|                     |                                    | No          | 33                    | 78.57                           |
|                     |                                    | Total       | 42                    | 100                             |
| Sanitary inspection | Yes                                | 14          | 33.33                 |                                 |
|                     | No                                 | 28          | 66.67                 |                                 |
|                     | Total                              | 42          | 100                   |                                 |

Figure 8 showed among all (112) the respondents (both the official and beneficiaries), most of the respondents expressed their agreement about increasing awareness of the people (89 respondents

out of 112), decreasing diseases/health hazards (84 respondents out of 112) and increasing water quality (83 respondents out of 112).

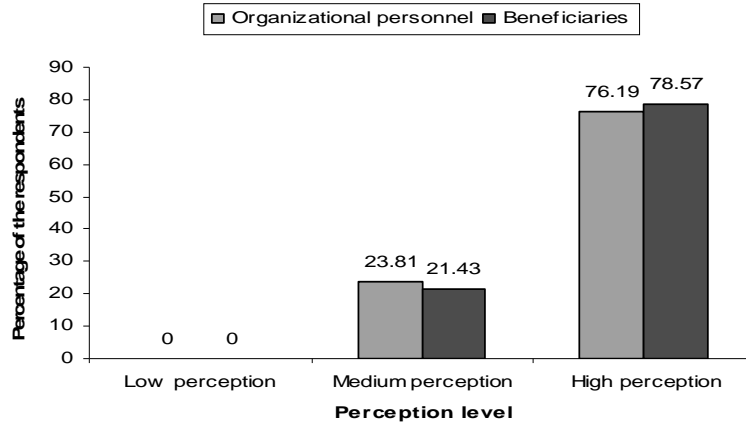


**Figure 8. Perception of the respondents according to benefits to implement water safety plans**



The overall perception scores of the respondents for the benefits were calculated. Based on the obtained score regarding perception, the respondents were

classified into three categories (Appendix IV, Table 9). Most of the respondents (78.57% beneficiaries and 76.19% organizational personnel) had high perception



**Figure 9. Distribution of the respondents (Both organizational personnel and beneficiaries) according to their perception of benefits of WSP**

**Limitations to implement water safety plans**

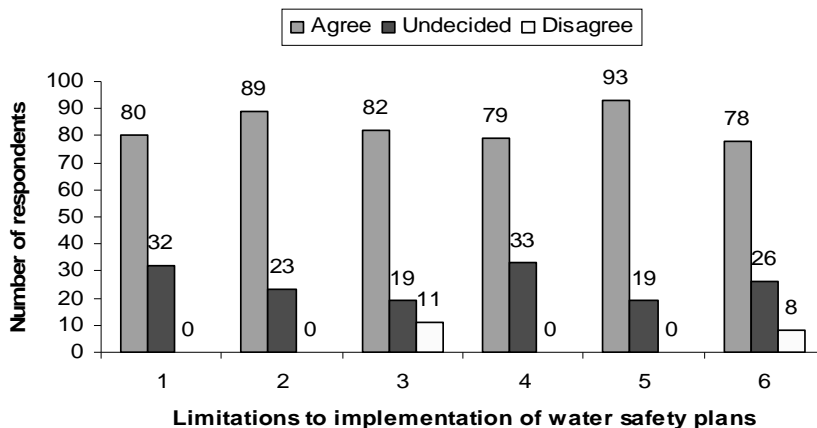
In the study area, it was clearly found that there are limitations to implement water safety plans as discussed the results in the above points of this chapter.

The respondents’ perceptions were tested on the basis of analysis of selected 6 limitations. In this session the respondents’ perception are analyzed for interpretation and understanding chronologically. Firstly, the distribution of the respondents was done based on their perception against each of the 6 statements i.e., the limitations as well as the overall perception regarding the limitations to implement the water safety plans.

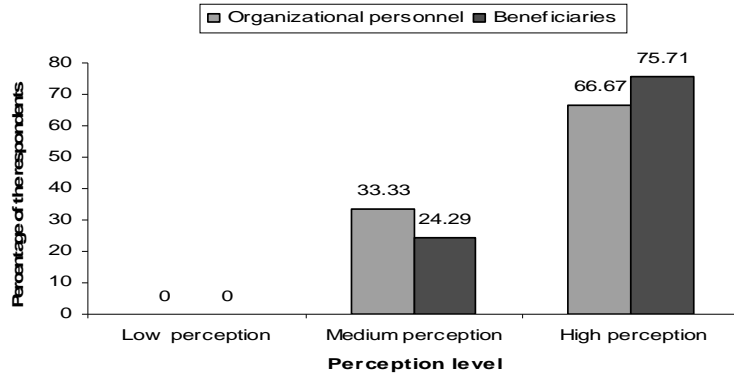
It is very difficult to determine the perception of an individual regarding anything because perception varies from individual to individual. Same thing could be perceived differently/different ways by different

individual. However, the respondents were asked to express their perception by indicating agreement against each of the selected 6 statements related to limitations to implement water safety plans and based on the agreements (opinions), the respondents were distributed in different agreement categories as shown in Appendix IV, Table 10.

Figure 10 was showed among all the respondents (both the official and beneficiaries), most of the respondents expressed their agreement about Poor economic condition of the people ( 93 respondents out of 112), lack of awareness of the people (89 respondents out of 112), lack of education of the people (82 respondents out of 112), lack of Knowledge on WSP (80 respondents out of 112), lack of experienced or skilled personnel (79 respondents out of 112), Lack of laboratory facility (78 respondents out of 112).



Note: 1=Lack of Knowledge on water safety plans, 2=lack of awareness of the people, 3=Lack of education of the people, 4=Lack of experienced or skilled personnel, 5=Poor economic condition of the people, 6= Lack of laboratory facility



**Figure 10. Perception of the respondents according to limitations to implement water safety plans**

**Figure 11. Distribution of the respondents (Both organizational personnel and beneficiaries) according to their perception of limitations of water safety plans**

The overall perception scores of the respondents for the limitations to implement water safety plans were calculated. Based on the obtained score regarding perception, the respondents were classified into three categories. Majority of the respondents (75.71% beneficiaries and 66.67% organizational personnel) had high perception (Figure 11).

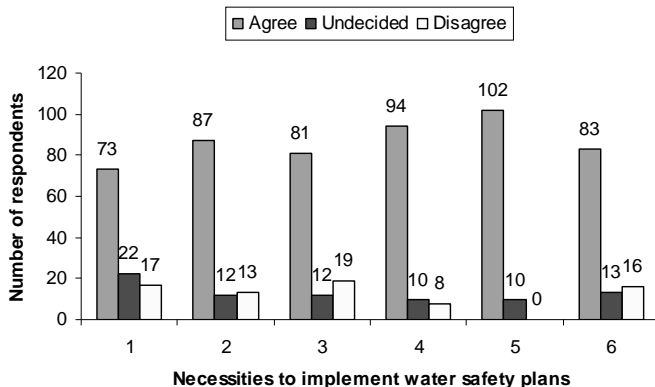
**Necessities to implement water safety plans**

In the study area, it was clearly found that there are necessities to implement water safety plans as discussed the results in the above points of this chapter.

The respondents’ perceptions were tested on the basis of analysis of selected 6 limitations. In this session the respondents’ perception are analyzed for interpretation and understanding chronologically. Firstly, the distribution of the respondents was done based on their perception against each of the 6 statements i.e., the necessities as well as the overall perception regarding the necessities to implement the water safety plans.

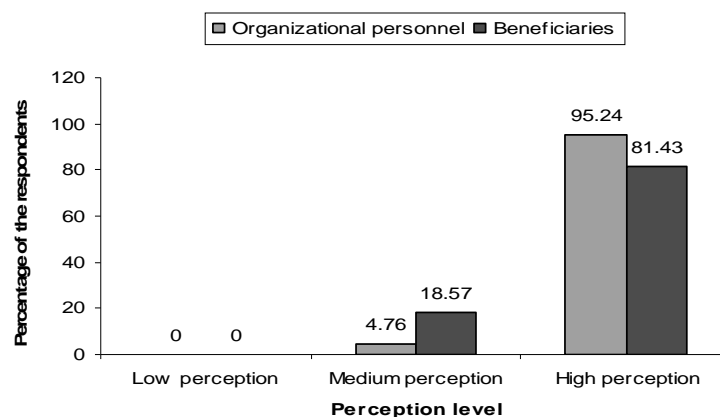
It is very difficult to determine the perception of an individual regarding anything because perception varies from individual to individual. Same thing could be perceived differently/different ways by different individual. However, the respondents were asked to express their perception by indicating agreement against each of the selected 6 statements related to necessities to implement water safety plans and based on the agreements (opinions), the respondents were distributed in different agreement categories.

Figure 12 was showed among all the respondents (both the official and beneficiaries), most of the respondents expressed their agreement about financial support should be improved ( 102 respondents out of 112), experienced/skilled personnel should be involved (94 respondents out of 112), training program should be increased (87 respondents out of 112), awareness among the root level people should be improved (83 respondents out of 112), hygiene education should be increased (81 respondents out of 112), communication materials should be increased (73 respondents out of 112).



Note: 1= Communication materials should be increased, 2= Training program should be increased, 3= Hygiene education should be increased, 4= Experienced/skilled personnel should be involved, 5= Financial support should be improved, 6= Awareness among the root level people should be improved

**Figure 12. Perception of the respondents according to necessities to implement water safety plans**



**Figure 13. Distribution of the respondents (Both organizational personnel and beneficiaries) according to their perception of needs of WSP**

The overall perception scores of the respondents for the necessities to implement the water safety plans were calculated. Based on the obtained score regarding perception, the respondents were classified into three categories as shown in the Appendix IV, Table 13. Majority of the respondents (95.24% organizational personnel and 81.43% beneficiaries) had high perception (Figure 13).

### Conclusion

The water sector in Bangladesh has made significant efforts to develop and implement water safety plans (WSPs) for rural and urban water supplies. The World Health Organization promotes the use of water safety plans in the 3rd edition of the Guidelines for Drinking Water Quality as a key component of an overall water safety framework. The results of the study had been very positive and the success of a diverse range of organizations in implementing WSPs.

In this study, most of the respondents about 60% were found to say their water availability was good where as different organization were said it was 69.05%. Flood was found to be the major problem as indicated by 71.43% respondents of beneficiaries. Among all the beneficiaries 82.86% beneficiaries were indicated communication materials were available. This investigation found majority of the rain water harvesting was in high risk 83.33% followed by deep tube well 66.67%. The result was clearly showed the chances of contamination was high in the period of covering the water vessels during storage of water about 64.71% and the chances of contamination was

very low in the period of handling the water at home 11.76%. About 35.29% respondents disinfect the water during storage.

Finally, it could be concluded that water safety plans are by their nature dynamic and require regular review and updating. Different water supply projects need to ensure that there is regular interaction and collaboration to support widespread implementation of water safety plans and the development of a water safety framework for Bangladesh.

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