CHAPTER-7
Chapter 7
Society and drinking water scenario

7.1 Background
Taking into consideration the general uncertainty among the residents of the study area about the use of surface water, it was thought worthwhile to conduct a sample social survey to understand the attitude, knowledge and their approach on handling drinking water. As the surface water is well known to be contaminated by many pollutants (e.g. originated from industrial activities, household activities, human waste, and poor environmental and garbage management) including micro-organisms related to water-borne diseases, in order to reduce the burden of water-borne diseases, majority of people today drink the pathogen free ground water. Morbidity and mortality rates from water-borne diseases fell dramatically over the years, and tube wells now became the mainstay in rural drinking water supply systems in Assam. But unfortunately the groundwater of the study area is reported of arsenic contamination ranging between 1.2 µg/L to 211 µg/L. The BIS permissible limit of arsenic in drinking water being 50 µg/L, it is seen that 24 % of the study area was arsenic contaminated. Tubewell water was not tested for arsenic for years and arsenic was discovered in Assam in high quantities only in 2004 (Singh et al., 2004). Such study was conducted in many parts of Bangladesh (Paul, 2004; Ahmed et al., 2005; Brindel et al., 2009) however no report of social survey in water quality is reported from Nalbari district.

With the “Total Sanitation Campaign” in full swing all throughout the country, an attempt was also made to know the present situation on the study area regarding sanitation and hygiene. This will provides an indication of current performance and the information could also be used for better design, construction and maintenance of water quality by the authority. It would also facilitate in improved training of communities, raising awareness within the society, behavioural changes within the community regarding safe drinking water. Main purpose of this study is to ascertain whether the public are aware about important aspects of arsenic poisoning including the sources and the means by which it can be prevented.
7.2 Methodology
A pre designed questionnaire was prepared and during personal interview with the respondent their response was filled. The face-to-face interview was conducted among the selected respondents and it took slightly over half an hour to complete each interview. The questionnaire of the survey is enlisted in Annexure I. Questionnaire surveys administered among 150 residents of four villages in rural areas in Nalbari district provided the primary source of data for this study. Two villages were selected from no risk zone and two from high risk zone. Nalbari town and Tihu was selected from no risk zone while Alegidal and Bihampur was selected from risk zone. The questionnaire included two broad sections: a socio-demographic section which included questions occupation, income, and landholding size of the respondent and a section to characterize respondent knowledge of the drinking water quality, arsenic contamination problem; and sanitation norms.

7.3 Demographic pattern of the study area
From each selected household, one individual was interviewed. In more than 50% of cases, the interviewed person was also the head of the family. Fig 7.1. shows the respondents occupational categories along with six groups, farmers, business man, service holders, daily wagers and others. 40% of the population is involved if agriculture, followed by business (24%). Business generally included shops selling betel nuts, rations and other accessories. Business was popular among the educated unemployed class. 10 % of the respondents were service holders working in schools or other government organizations. ‘Others’ include craftmans, handloom weavers, bamboo craftsman, etc. Handlooms items are generally prepared by the rural women folk of Assam for household purposes and rarely for business. Fig 7.2. gives the land holding size of the respondents categorized as landless (having no land at all), small (1 katha – 2 bighas), medium (2 bighas – 5 bighas), large (> 5 bighas). It is seen 40% of the respondents were small landholders, 33% are medium land holders, 17 % are large land holders with only 6% of landless respondents. Further it is seen that some of the respondents having large land holding did not do farming themselves. Instead they give ‘addhi’ a system where somebody else is made to cultivate their land and in return he gets 50% share of the harvest. ‘Addhi’ is generally performed by the landless and the daily wagers. ‘Addhi’ is
a kind of agricultural tenancy under which the tenant gives half of the crop grown in a year as rent to the landlord.

Fig 7.1: Pie diagram showing the occupation distribution among the respondents

Fig 7.2: Land holding size of the respondents.
All respondent were enquired about their monthly income. About 14% of the respondent earned less than Rs 1500 per month who were mainly daily wagers. 43% earned between Rs 1500 to Rs 5000 which comprised mainly of farmers and small business man. 29% were earning between Rs 5000 to Rs 10000 who were involved in business (shopes). 10% of the respondents were earning Rs 10000 to Rs 20000, and they were mainly government servants working in schools and other government organizations. Only 4% of the respondents were earnings more than Rs 20000 and they were mainly involved in dual profession (service holders and farmers) (Fig 7.3).

![Monthly income](image)

**Fig 7.3.** Pie diagram showing monthly income of the respondent.

The questionnaire included questions on occupation of head of households, ownership of services and facilities and observations on housing type. Many households had multiple income sources or earners. Though it is possible to formulate an income index that accounts for a variety of factors this was not possible within the scope of this assessment.

### 7.4 Knowledge of water quality

The opinion of the people regarding the quality of water they are consuming has been categories were prepared, very good, good, average, poor and very poor. It is seen that none of the respondent acknowledged that they were drinking very good quality water. Only 16% said their water was ‘good’, however 54% of the respondent said
they were drinking average quality water. 20% of the respondent said their water quality was poor and 10% regarded it as very poor (Fig 7.4). The main reason behind this poor water category was excessive amount of iron precipitation which gives reddish colour to the water. None of them reported about arsenic in their drinking water.

In the study area shallow tubewells were more popular as they were easy to install and free from bacterial contamination. During the study the author did not come across a

![Drinking water quality](image1)

Fig 7.4: Drinking water quality opinion of the respondents.

![Source of drinking water](image2)

![Age of the source (Tubewells)](image3)

Fig 7.5: (a) Drinking water source (b) Time duration from the installation of the tubewell.
single case where dug well or pond water was used for drinking purpose. The people of the study area were aware of the bacterial contamination of surface water and hence preferred groundwater which was regarded to be of a superior quality than surface water. Majority of the population (70%) were using the tube well water for drinking purposes and only 30% had access to piped water supply [Fig 7.5 (a)]. On being questioned about the age of the source 43% respondents were using tube wells which were installed 5 to 10 years ago, while 26 % had 10-15 years old tube wells. 14 % were using tube wells which were installed 20 years back and only 17 % had newly installed tube wells (less than 5 years) [Fig 7.5 (b)]. However regarding the maintenance of the tube wells the response was not very encouraging as 64% of the respondent did not maintain their tubewells at all and only 36 % of the respondents maintained the water source annually [Fig 7.6(a)]. These respondents were aware of the tube well maintenance by chlorination. The categorized distribution of depth of the aquifers is shown in Fig 7.6 (b) where 80 % of the aquifers are confined within 21 to 40 meters depth.

![Source maintenance](a)

![Aquifer depth (in meters)](b)

Fig 7.6. (a) Source maintenance by respondents (b) Depth of the aquifers
Regarding the filtration or treatment techniques adopted by the population, 87% of the respondent [Fig 7.7 (a)] were adopting one or the other filtration technique and the most common method was sand filtration [Fig 7.7 (b)].

Iron is a contaminant in the study area with majority of the water samples showing iron concentration higher than the WHO permissible limit of 0.3 mg/l. Sand is an effective medium for removing iron and arsenic from water (Ali et al., 2001; Ahmed, 2003). It has been reported that most iron removal plants can also lower arsenic content of tubewell water to half to one-fifth of the original concentration. Here As(III) is oxidized to As(V) in the plants, and removes arsenic by adsorption (Dahi and Liang, 1998). This type of pro-poor water engineering which have developed with little external finance, building upon self-help principles are very popular in many poor countries, especially in rural areas. This might be one of the reason which is safeguarding the population against the adverse effects of arsenic. Sand filter extensively used in the rural area is given in Fig 7.8. Iron has no known effect on health, but adversely affects aesthetic quality of water and may cause problems in other domestic uses of water.

It is reported that 48% of the respondent adopted only sand filtration, while 17% mentioned of candle filtering their water after sand filtration. 15% of respondent used candle for filtering and they were mainly the piped water supply users. 14% of the
respondent adopted sand filtration followed by boiling and only 7% undertook the process of sand filtration followed by boiling and then storing in ceramic filters. The percentage of people adopting to boiling water before drinking is very low and the main reason behind it the loss of taste of water due to boiling. It is also seen that 13% of the respondent did not adopt any filtration methods and they consider their water to be of good quality and any prior treatment was not necessary [Fig. 7.7 (b)].

As many diseases are caused due to poor sanitation conditions, it was imperative to know the hygienic condition maintained by the fellow respondents. It is seen that 62% of the population do not have proper sanitation facilities (Fig 7.9, a). Proper concrete leach pit was lacking in most of the cases. In some cases sanitary latrines were provided from the government under “Total Sanitation Campaign”. Regarding the distance between the sanitary and the tubewell it is seen that 21% of the latrines are very close to the water source. 20% are within the range of 10 to 20 meters and 28% are within a range of 21 to 30 meters, 8% are within a range of 31 to 40 meters, 12% within a range of 41 to 50 meters and only in 11% of the cases there is a 50 meters distance between source and the sanitary pit. The most common diseases in the study area are viral fever, cold and diarrhoea followed by jaundice. However, 80% respondents do not blame the drinking water for the occurrence of these diseases.
As 50% of the respondents were from risk zones, it was necessary to know their level of awareness about arsenic and its health impacts. It is seen that only 27% of the respondents had access to piped water supply in this arsenic risk area, and 73% were still consuming water from contaminated sources as they did not have any other alternatives [Fig 7.10 (a)]. About 87% of the respondents at least knew about arsenic in groundwater, and the rest 13% had never heard about arsenic [Fig 7.10 (b)]. All the 65 respondents who heard of it were male members and got the information through words of mouth.

Fig 7.10: (a) Source of drinking water in arsenic risk zone (b) Arsenic awareness among the respondents.
Moreover it is observed that most of these people complained that water was collected from their tube wells at times by PHED officials but the results of the chemical analysis of their water quality was never given to them. There was great disappointment among the people on this action. The people were absolutely unaware of the carcinogenic nature of arsenic and were more apprehensive about iron than arsenic. They considered that the stomach problems they frequently suffer were mainly because of iron contaminated water.

As water is slowly becoming a scarce commodity it was important to know about the willingness of the population to pay for water. It was seen that 76% of the respondent were not willing to pay for water (Fig 7.11). Only 24% gave their willingness to pay for drinking water of which 72% were not ready to pay above Rs 50 per month for water. 22% respondent were willing to give Rs 51-Rs 100 for water and only 6% was ready to pay as much as Rs 200 for water. None of the respondent in the study area was willing to pay more than Rs 200 for water. The respondent who were willing to pay more than Rs 100 were generally service holders.

![Fig. 7.11: (a) Willingness of respondents to pay for drinking water (b) Amount the respondents wanted to pay for water.](image)

Fig. 7.11: (a) Willingness of respondents to pay for drinking water (b) Amount the respondents wanted to pay for water.

The United Nations Development Programme (UNDP) suggests that water costs should not exceed 3 per cent of household income.

### 7.5 Conclusion

Analysis of the survey data reveals that arsenic awareness is currently not widespread in the study villages under the study area, particularly in the low arsenic risk region.
There are also gaps in arsenic knowledge regarding the diseases caused by arsenic poisoning and mitigating measures available to prevent contamination. The viral and bacterial pathogen are made accountable for the disease burden. Majority of the respondents have not heard of arsenic. In the high risk area only half the population knew about arsenic poisoning but did not have any knowledge of the consequences of its consumption. None were aware of the carcinogenic nature of arsenic. It is seen that the local media, TV and radio were not very active in wide spreading the health effects of arsenic in a massive way. The common people strongly believed that minor stomach ailments were due to arsenic contaminated water. Not a single respondent ever hard about any alternative methods like rainwater harvesting system, pond sand filters (PSF) etc which is today becoming very popular in Bangladesh.

It is recommended that the public should be made aware of the arsenic problem in their locality. Visual posters should be put up in risk zones, children should be told about the problem at schools and other social gathering. Till date no detailed medical survey of the population in the study area was conducted and emphasis was never given on such medical surveys. Instructing consumers on simple methodologies to ensure safe microbiological water quality is essential for reducing the incidence of water borne disease. Consumer awareness is essential in order to reduce disease burden and achieve socioeconomic growth and development in the region.