

# Environmental Health and Climate Change Adaptation Capacity Building among Schools in Disaster Prone and Arsenic Affected Area, Narail, Bangladesh



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**Environmental Health and Climate Change Adaptation Capacity  
Building among Schools in Disaster Prone and Arsenic Affected  
Area, Narail, Bangladesh**

Activity report: June to November 2012

Prepared by

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**Environment and Population Research Centre (EPRC)**  
In Collaboration with  
**Bangladesh Water Partnership (BWP)**

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## **Executive Summary**

Safe drinking water is the basic right of every citizen and is vital for improving health and alleviating poverty. In adopting the Millennium Development Goals (MDGs) countries pledged to reduce by half the proportion of people without access to safe drinking water by 2015. Bangladesh is one of the most disasters prone countries of the world. About 80% of diseases in Bangladesh are associated with water. Safe water is a greatest challenge to the people of Bangladesh. Health Statistics indicate approximately 342 children are dying every day for causes which are associated with exposure to contamination risks related to lack of safe drinking water. As about half of the adult population and most of the children defecate in unhygienic latrines, biological pollution is one of the main environmental health management challenges. UNICEF found that 22 million people were drinking arsenic contaminated water ( $>0.05$  mg/l arsenic) during its 2009 water quality assessment survey.

The main objective is to improve appropriate knowledge and practices about environmental health after climate change adaptation in Integrated Water Resource Management (IWRM) based on phased activities in schools and communities.

The study area is affected by both arsenic contamination of ground water, partly annual floods and salinity. It is situated on the bank of the river Chitra. Four schools were selected randomly for imparting training to the students. Trainings were conducted three times among the students of the selected schools and teachers through workshop. A quiz competition was arranged for the students in order to compare their knowledge before and after training. During the training period water quality was tested to determine Arsenic, DO, turbidity and temperature of water. The students were also trained on how to detect As, DO, turbidity and temperature practically. Baseline survey and final survey were completed among the students. During the final survey, the student's knowledge was found quite satisfactory. Lastly, a class wise committee was formed with students in each school for follow up action.

BWP-GWP and other development partners should be encouraged to undertake this kind of educational intervention in all parts of the country.

## Table of Contents

Description	Page
Acknowledgement	3
Executive summary	4
Table of Contents	5
Lists of Tables	6
Lists of Figures	6
Lists of Abbreviation	7
<b>Chapter-1 Introduction</b>	<b>8-9</b>
1.1 Background	8
1.2 Objectives	9
<b>Chapter-2 Methodology</b>	<b>10-13</b>
2.1. Design	10
2.2. Study Area	11
2.3.1 <i>Method of selection of School</i>	11
2.3.2 <i>Educational intervention</i>	11
2.3.3 <i>Monitoring and data collection</i>	12
2.3.4 <i>Data management and analysis</i>	12
2.3.5 <i>Materials used for water test, training program and workshop</i>	12
2.4 Main activities	12
2.5 Management	13
<b>Chapter-3 : Results and Discussions</b>	<b>14-20</b>
3.1 Characteristics of the selected Schools	15
3.2 Level of knowledge among students	16
3.2.1 <i>Access to safe drinking water supply and its related knowledge</i>	17
3.2.2 <i>Access to sanitation facilities and its related knowledge</i>	18
3.2.3 <i>Knowledge and practices about hand washing</i>	19
3.3 Workshop	19
<b>Chapter- 4 Conclusions and recommendations</b>	<b>21-22</b>
4.1 Conclusions	21
4.2 Recommendations	22
References	23
Annex I (Teachers training Participants List)	24

## LIST OF TABLES

		Page
Table 3.1	Characteristics of the selected Schools	15
Table 3.2	Results on level of knowledge about IWRM among students	16
Table 3.3	Results on level of knowledge on water cycle among students	16
Table 3.4	Results on level of knowledge climate change on among students	17
Table 3.5	Quality of water drank by the students	17
Table: 3.6	Results on level of knowledge treatment of drinking water in flood and cyclone among students	18
Table 3.7	Access to sanitation facilities	18
Table 3.8	Knowledge and practices about hand washing	19

## LIST OF FIGURES

		Page
Figure 3.1	Schematic diagram of the project profile	10
Figure 3.2	Locations of the study areas	11

### **List of Abbreviations**

BWP	Bangladesh Water Partnership
IPCC	Intergovernmental Plan on Climate Change
BL	Base Line
DO	Dissolve Oxygen
DTW	Deep Tube well
EH	Environmental Health
EPRC	Environment and Population Research Centre
IWA	International Water Association
IWRM	Integrated Water Resources Management
GIS	Geographical Information System
GPS	Global Positioning System
GWP	Global Water Partnership
MDG	Millennium Development Goal
SMC	School Management Committee
STW	Shallow Tube well

### Introduction

#### 1.1 Background

According to the Fourth Assessment Report of IPCC, South Asia is the most vulnerable region of the world to climate change impacts. The international community also recognizes that Bangladesh ranks high in the list of most vulnerable countries on earth. The high vulnerability of Bangladesh to climate change is due to a number of hydro-geological and socio-economic factors.

Safe drinking water is the basic right of every citizen and is vital for improving health and in alleviating poverty. In adopting the Millennium Development Goals (MDGs) countries have pledged to reduce by half the proportion of people without access to safe drinking water by 2015. Bangladesh is a diarrhoea epidemic prone country and contaminated water related epidemics are common. Health statistics indicate that approximately 342 children are dying every day for causes which are associated with exposure to contamination risks related to lack of safe drinking water. As about half of the adult population and most of the children defecate in unhygienic latrines, biological pollution is one of the main environmental health management challenges. Therefore, it is important and urgent that climate change adaptation related to safe drinking water be promoted in all sectors and through all major partners/institutions. Schools have been identified as a main partner in promoting surface water and drinking water, health and other basic issues, in addition to the fact that it needs capacity building. They have the potentials to reach a wide number of populations and thereby contribute to the improvements among those reached as well as among the populations who are close to reached ones. Schools come in close contact with all classes of populations living under different conditions across a country. This report presents the results of a brief project on environmental health promotion among selected schools in climate vulnerable southern parts of Bangladesh. Here environmental health refers to selected basic drinking water, sanitation and hygiene (WASH) issues.

#### 1.2 Objectives

The main objective was to promote improvement of the knowledge regarding appropriate environmental health (EH) and practices in Integrated Water Resource Management (IWRM)

and climate change perspectives based on phased activities among students of some selected schools in disaster prone, salinity and arsenic affected areas of Narail district in Bangladesh.

The specific objectives of the project were to:

- i) educate and increase the level of practical knowledge about climate change impacts and its adaptation as well as about IWRM ,
- ii) promote EH in climate change and IWRM perspectives,
- iii) observe the related changes in the level of knowledge and practices,

## Methodology

### 2.1 Design

The project design adopted educational intervention based on observational longitudinal method. The selected environmental health (EH) issues include: integrated water resource management (IWRM), water cycle, climate change and its impacts, safe drinking water, water safety and its management, safe latrine use and its management and safe hand washing. Combined qualitative and quantitative methods of data collection were implemented. Field activities of the project were carried out over a period of 6 months.

A schematic diagram of the project profile is given below:

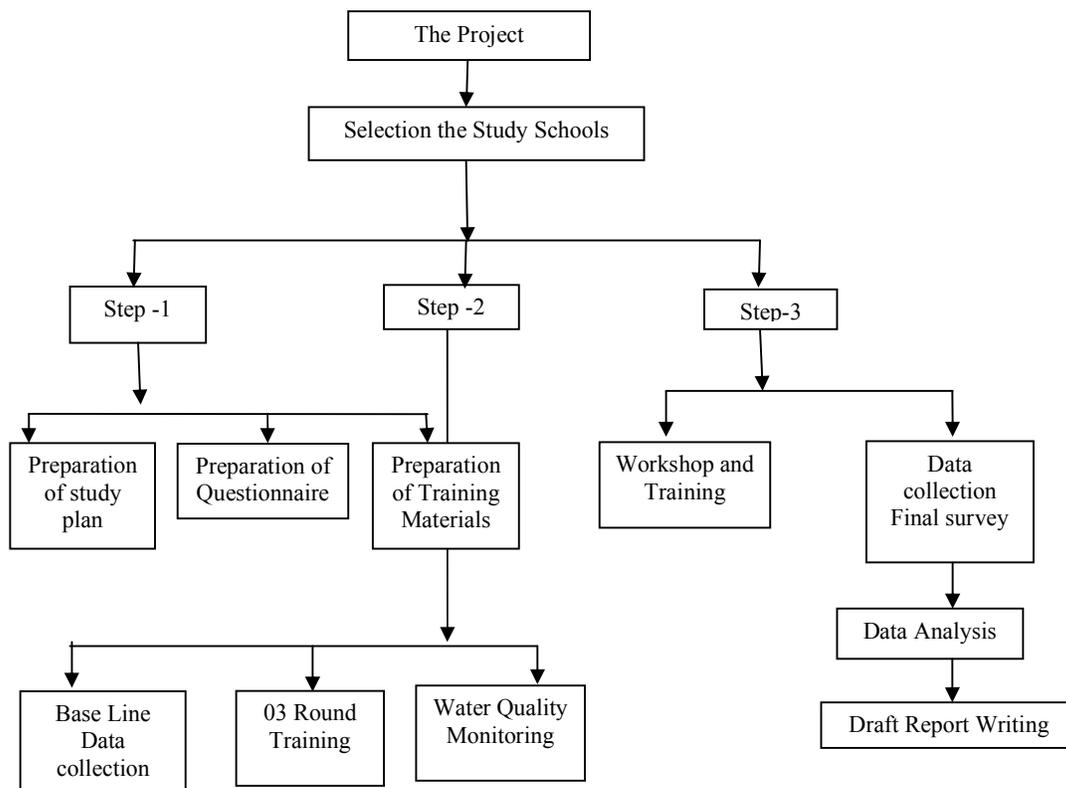


Fig: 3.1: Schematic diagram of the project profile

## 2.2 Study Area

The project was conducted at selected 4 schools located at Kalia and Narail Sadar sub-districts under Narail district. The project areas are presented in the Fig. 3.2. Reportedly both the social and environmental situations of the selected sub-districts are vulnerable.

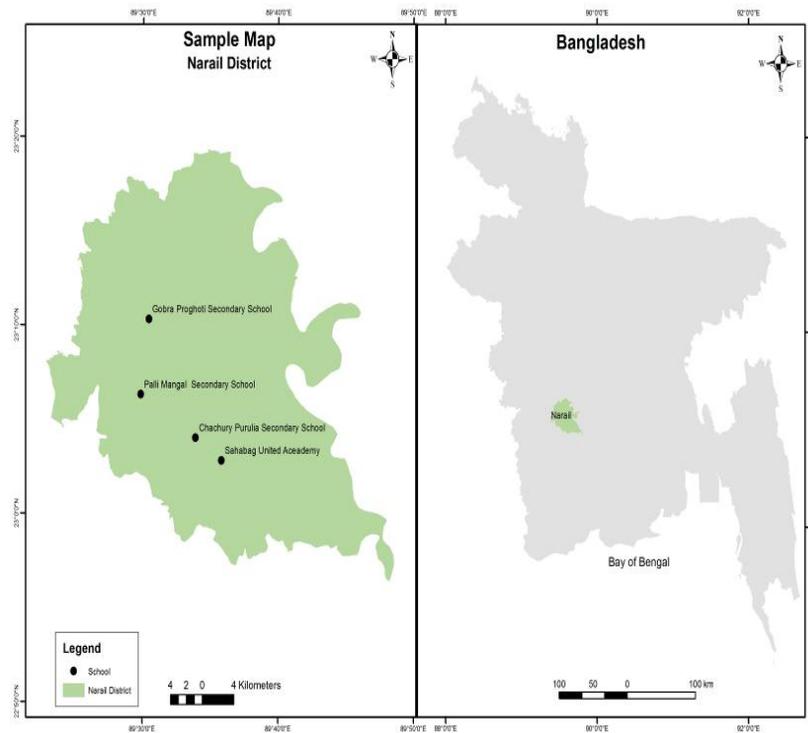


Fig. 3.2: Locations of the study areas

### 2.3.1 Method of selection of School

Four schools were selected at Sadar and Kalia Upazila under Narail district based on consultation with sub-district education officer. The four schools represented areas at risks from arsenic, salinity and flood problems. The headmasters of the schools were contacted about their interests before finalizing the sites.

### 2.3.2 Educational intervention

The educational intervention mainly included lectures and demonstration among students at selected schools and a workshop among representatives from teachers and school management committees. Also provided education among the schools based on three time lecture sessions per school on the selected topics over a period of about 6 months. It was

planned in consultation with the school authorities. Every session included lectures and demonstration about the EH topics among the various class groups over a day. The class groups were: six to eighth grade and ninth to tenth grades in each school. The first training session included information about: climate change, water cycle, IWRM, the project and importance of EH. The second session included: review of the last class, safe drinking water with water safety plans and sanitation. The third session included review of the students about earlier classes and hygiene. The class teachers also participated in the training. Also, made a plan for future activities for the students and a committee was formed in each class with two students to follow-up dissemination of the information.

A day long training workshop was organized among teachers and school management committees from all 4 study schools and other schools. The training programs were divided into 4 sessions such as 1) Opening ; 2) Group work on the existing situation, 3) Training about the EH issues and 4) Discussion and recommendation.

### ***2.3.3 Monitoring and data collection***

A baseline and final survey were carried out in every school. During the survey 20 students from every school (in total 80 students per survey) were randomly interviewed about the issues. A quiz was administered after the final session.

### ***2.3.4 Data management and analysis***

SPSS 11.5 and Microsoft Excel were used for data management and analyses.

### ***2.3.5 Materials used for water test, training program and workshop***

Training manual and guidelines provided by EPRC were used during the training period. Brown paper was distributed for group work in the workshop. IWA Water Test Kit box was used for P<sup>H</sup>, DO, turbidity and temperature test and HACK kit box used for Arsenic.

## **2.4 Main activities**

The main activities of the project included:

- (i) School selection and planning of the intervention with the concerned teachers, EPRC Local staff, and DPHE.

- (ii) Development of educational materials based on EPRC documents.
- (iii) Planned and implemented educational sessions among the students.
- (iv) Conducted training among the teachers and representatives of school management committee.
- (v) Conducted sample baseline and final surveys on the level of knowledge and related practices in the schools.
- (vi) Conducted water quality test such as Arsenic (As), dissolved oxygen (DO), pH, turbidity, temperature.
- (vii) Conducted data coding, entering, cleaning and analysis.
- (viii) Prepared area map.
- (ix) Prepared progress and final reports.

## **2.5 Management**

The study was implemented by EPRC. EPRC is a multi-disciplinary non-governmental research, educational, training and networking organization. Its vision is to redress sufferings of the poor through appropriate management/development of water, hygiene, sanitation, agriculture, forestry, energy, food, disaster risks, education, health and social scopes in local, regional and global levels. The strategic objectives include research and development of knowledge, technology, human resources, natural resources, institutions, monitoring and evaluation in its fields of interests. It has been working in the fields of environment, water, education, agriculture, hygiene, health, food security, disaster risks management and its related social and policy issues. In addition, EPRC supports and co-educates post graduate students from Universities in Bangladesh and other countries.

### Results and Discussion

School environmental health has immediate as well as long term important implications for education, health and well being towards sustainable development of the country. Although Bangladesh has achieved remarkable success in primary education and health; it has one of the highest dropout rates of the world. Promotion of environmental health (educational and structural) in schools has been found to be associated with improvements in health as well as reduction in dropout rates (UNICEF, 2006). There are approximately 70,000 primary schools and 17000 secondary schools in Bangladesh. More than 20 million students are enrolled in the primary schools. According to an UNICEF assessment in primary schools: (i) about 53% have functional safe water tube well and the rest does not have any option or have non-functional options and (ii) about 6% have no latrine, 25% have 1 latrine, 47% have 2 latrines and 12% has more than one latrine. Latrine is kept reserved for the use of teachers, where there is one latrine. Moreover, there are alarming questions about the quality of drinking water and hygienic practices existing in many schools of Bangladesh (arsenic, salinity, bacteriological and other contamination) [ Bilqis A. Hoque *et al.*2009 ].

Overall, more than 1800 students were reached directly under the intensive approach of the project. There were about 1200 students under the general approach and some of those students might be reached too, depending on how the trained 25 teachers communicated the messages to them. The rates of knowledge, attitude practices about the educated EH or water, sanitation and hygiene issues among the students and teachers improved significantly after the intervention

#### 3.1 Characteristics of the selected Schools

The selected schools were from flood affected, arsenic contamination and salinity prone areas of Narail district. The following table summarizes the characteristics of the schools.

Table 3. 1: Summary of selected characteristics of the project schools.

Sl No	Name of Schools	District/Sub-districts	Type of sub-districts	Number of Students		Vulnerability
				Boys	Girls	
01	Shahbag United Academy,	Kalia, Narail	Coastal and under Southwest Project	283	335	Flood, Arsenic Salinity
02	Chanchuri Purulia Secondary School	Kalia, Narail	Coastal and under Southwest Project	344	384	Under Southwest project, flood and Arsenic prone area
03	Palli Mangal Secondary School	Kalia, Narail	Coastal and under Southwest Project	104	128	Water log, heavy rainfall flooded, most arsenic
04	Gobra Progoti Secondary School	Narail, Sadar	Coastal and under Southwest Project	146	149	On the bank of the Chitra river, salinity area

All the schools were secondary non-government high schools with MPO registration. In total, there were about 1873 students. Almost half of the students were females except Gobra Progoti Secondary school in Narail Sadar. All schools are located in rural areas except Gobra Secondary School which is located in urban area of Narail. The Kalia sub-district is exposed to the risks for arsenic contaminated groundwater. The Gobra School is located inside GWP-BWP funded Chitra-Nabaganga Area Water Partnership Project conducted by EPRC.

### 3.2 Level of knowledge among students

The level of knowledge of the students was poor before the training on IWRM (Table 3.2). About 100% of the interviewed students were not aware or had heard about 'IWRM' in the base line survey. After training, most of the students answered the meaning of IWRM properly in the final survey.

Table 3.2: Results on level of knowledge about IWRM among students

Variable (multiple response)	Base line (N=80) %				Final Survey (N=80) %			
	Cha	Shah	Pall	Gobr	Cha	Shah	Pall	Gobr
Know about IWRM								
- Do not know	100.0	100.0	100.0	100.0	22.2	11.1	26.3	23.3
- Use water properly	0.0	0.0	0.0	0.0	60.2	55.6	48.8	50.3
-Use water with everybody	0.0	0.0	0.0	0.0	17.6	27.8	25.0	26.4
- Reduce misuse	0.0	0.0	0.0	0.0	0.0	5.5	0.0	0.0

Cha = Chanchuri Purulia Secondary School, Shah = Shahbag United Academy, Pall = Palli Mangal Secondary School, Gobr =Gobra Progoti Secondary School

Most of the students were aware about water cycle but they could not answer accurately (Table 3.3). After training, they answered accurately about water cycle in final survey.

Table 3.3: Results on level of knowledge on water cycle among student:

Variable (multiple response)	Base line (N=80) %				Final Survey (N=80) %			
	Cha	Shah	Pall	Gobr	Cha	Shah	Pall	Gobr
Know about Water cycle								
-Do not Know	30.0	0.0	10.0	4.5	15.0	10.0	10.0	10.0
- Correct answer	25.9	40.0	15.0	22.7	65.0	85.0	75.0	90.0
- Not Correct	18.2	35.0	40.0	41.0	15.0	5.0	15.0	0.0
- .others	25.9	25.0	35.0	31.8	5.0	0.0	0.0	0.0

Cha =

Chanchuri Purulia Secondary School, Shah = Shahbag United Academy, Pall = Palli Mangal Secondary School, Gobr =Gobra Progoti Secondary School

About 70-80% students had no idea about the impact of climate change in base line survey (Table 3.4). But 85% students had idea about impact of climate change in final survey. However, the students claimed that physical hazards were increasing for climate change.

Table 3.4: Results on level of knowledge climate change on among students

Variable (multiple response)	Base line (N=80) %				Final Survey (N=80) %			
	Cha	Shah	Pall	Gobr	Cha	Shah	Pall	Gobr
<i>Impacts of climate change:</i>								
-Do not know	77.8	81.0	76.2	62.5	4.2	10.0	15.0	5.0
-Floods	3.7	4.8	9.5	16.7	5.0	20.0	35.0	0.0
-Cyclone	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
-Drought	0.0	0.0	0.0	0.0	5.0	5.0	0.0	15.0
-Increase Physical Hazards	0.0	4.8	0.0	4.2	20.0	30.0	20.0	15.0
-Damage Environmental balance	18.5	9.6	14.3	16.7	55.0	35.0	30.0	65.0

Cha = Chanchuri Purulia Secondary School, Shah = Shahbag United Academy, Pall = Palli Mangal Secondary School, Gobr =Gobra Progoti Secondary School

The levels of knowledge on treatment of drinking water among students were observed during baseline survey (BL) and final survey (Table 3.5). The level of knowledge was low during the baseline survey and improved significantly during the final survey.

Table 3.5: Results on level of knowledge on treatment of drinking water:

Variable (multiple response)	Base line (N=80) %				Final Survey (N=80) %			
	Cha	Shah	Pall	Gobr	Cha	Shah	Pall	Gobr
Knowledge in treatment of drinking water	16.9	14.3	14.0	33.2	10.0	5.0	10.0	5.0
- Alum	18.5	11.0	9.5	4.2	60.0	60.0	65.0	80.0
- Boiling								
- Water purification tablet	16.9	14.3	14.3	4.2	5.0	15.0	5.0	0.0
- Bleaching powder	0.0	0.0	0.0	4.2	0.0	10.0	0.0	0.0
- Do not know	47.7	60.4	61.9	54.2	15.0	10.0	20.0	15.0

### 3.2.1 Access to safe drinking water supply and its related knowledge

The access to safe drinking water option among the students was not satisfactory; though all the 4 schools had a tube well for drinking water inside the compound. Out of 4 schools, 2 schools tubewells water had arsenic contamination above Bangladesh standard (>50 ppbl). Approximately 232 students drank arsenic contaminated water in Polli Mangal High School and about 728 students were exposed to the risks of drinking water with more or less arsenic contamination in Chenchuri Purulia Secondary School.

Table 3.6: Quality of water drank by the students

Name of School	Arsenic (ppb)	P <sup>H</sup>	Turbidity (NTU)	Temperature (C)
Sahbag United Academy High School	0	7	0	26
Chanchuri Purulia Secondary School	50.1	6.5	0	26
Polli Mangal High School	250	7	0	26
Gobra Progoti Secondary school	10	7	0	26

### 3.2.2 Access to sanitation facilities and its related knowledge

Almost all the schools had one or more latrines. Functional conditions of the latrines were found ok as none were leaking were overflowing. Three schools claimed that they had only

one latrine assigned for all students and teachers (Table 3.7). But the situation was found improved at final survey (additional 2 latrines were installed in each of the two schools).

Table 3.7: Access to sanitation facilities

Name of School	Baseline Survey	Final Survey
1. Sahbag United Academy High School	2	3
2 Chanchuri Purulia Secondary School	1	3
3. Polli Mangal High School	1	1
4. Gobra Progoti Secondary school	2	3

About 50% of the students informed that they felt comfortable to go to their toilets during the baseline survey and 75% during the final survey. Most of the respondents answered during the two times survey that the security in the schools was not a problem.

### 3.2.3 Knowledge and practices about hand washing

Most of the students used to wash left hand after defecation 67% to 85% and right hand 68% to 80% before eating in baseline and final survey (Table 3.8). The reported level of hand washing practices improved significantly after the training. Approximately 80.0% students of Chanchuri Purulia Secondary School, 85.0% Shahbag United Academy, 75.0% students of Palli Mangal Secondary School and 75.0% Gobra Progoti Secondary School claimed that they wash both hands after defecation as observed during the final round survey. Reportedly before eating about 60.0% students of Chanchuri Purulia Secondary School, 80.0% Shahbag United Academy, 75.0% students of Palli Mangal Secondary School and 85.0% Gobra Progoti Secondary School washed both hands.

3.8 Knowledge and practices about hand washing

Washing of hands:	Base line (N=80) %				Final Survey (N=80) %			
	Cha	Shah	Pall	Gobr	Cha	Shah	Pall	Gobr
1 After defecation								
-Left hand	85.0	67.0	79.0	80.0	20.0	15.0	25.0	25.0
-Both hands	15.0	33.0	21.0	20.0	80.0	85.0	75.0	75.0
2.Before eating:								
-Right hand	77.5	68.0	80.0	80.0	40.0	20.0	25.0	15.0
-Both hand	22.5	32.0	20.0	20.0	60.0	80.0	75.0	85.0

Cha = Chanchuri Purulia Secondary School, Shah = Shahbag United Academy, Pall = Palli Mangal Secondary School, Gobr = Gobra Progoti Secondary School

The rate of presence soap in the latrines increased significantly between the baseline (2 out of 6 latrines) and final surveys (6 out of 10 latrines). However, soap was not present in 40% of the latrines as found in the final survey.

### **3.4 Workshop**

The workshop was organized on 5<sup>th</sup> September, 2012 at EPRC training room in Narail Sadar. All the participants were provided folder, pen, note pad, training materials with EH massages, communication posters and refreshments with transport allowances. In total about 25 teachers, school management committee members and guests participated in the workshop. The project objectives, activity plan and EPRC, BWP were introduced to the participants. Mr Shajahan Mia, Thana Education Officer, Narail Sadar was the Chief guest of the workshop, and delivered his speech and briefed about the importance of the training.

During the second sessions, participants were divided into two groups for group-work on the EH issues included in the text books. During third session, lectures were delivered about IWRM, Climate change, EH and other related issues. During the fourth session, participants worked on the ways to improve the existing level of knowledge as well as access to the related basic facilities in the schools following the presentation of recommendations. The participants highly appreciated the educational project and the training imparted to them. They strongly recommended to: (i) continue training over another year for sustainable improvement in those schools, (ii) extend this program to other schools and (iii) help to improve the level of access to EH facilities. They expressed thanks to BWP-GWP and EPRC.

## **Conclusion and Recommendations**

Overall, about 1873 students were directly and indirectly benefited by the educational intervention of the study. The level of basic EH knowledge and its related facilities were found poor before the intervention. The study reconfirmed that rates of knowledge, attitude and practices about the educated EH issues among the students and teachers can be improved significantly after simple educational intervention as observed earlier (7,15).

### **4.1 Conclusions**

The following main conclusions can be drawn:

- i. The overall rates of improvement of knowledge among the students in final survey were significant as compared to those in the baseline survey. The rates of improvements, however, varied disproportionately over the various issues. The rate of improvements was low on some important issues, such as operation and maintenance of the technologies, global warming and other issues.
- ii. The students were not aware about IWRM before the intervention. They had some knowledge about climate change and its impacts as included in their text books. Both the levels of knowledge improved significantly after the educational intervention.
- iii. The level of access to safe drinking water was not found satisfactory as about half of the schools (2 schools) did not have arsenic safe drinking water technology (or tube well) in the compound.
- iv. The knowledge and reported practice about appropriate washing of hands was found to improve significantly between the baseline and final survey among the students.
- v. The rate of presence of soap in the latrines increased significantly between the baseline and final surveys but still about half of the schools could not show the presence of soap in the latrines.
- vi. The teachers, members of school management committees and Thana Education Officer appreciated the results of the educational project.

## **4.2 Recommendations**

The main recommendations were as follows:

- 1) The teachers should encourage and help the students to study about IWRM, climate change adaptation and related EH issues.
- 2) The teachers should establish and monitor hand washing facilities at the schools and encourage the students to wash hands properly.
- 3) The schools with government and non-government partners should arrange competition regarding EH/hand washing/sanitation on environment, water, hand washing, sanitation.
- 4) Adequate quality of educational materials should be prepared and distributed in all the schools
- 5) BWP-GWP and other development partners should be encouraged to undertake this kind of educational intervention in all parts of the country.

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## Annex I

### Teachers training Participants List

SL. No.	Name of Participants	Position	Name of Institution	Mobile No
1	Md . Shahjahan Mia	Asst. Upazila Secondary Education officer	Secondary Education Office	01711187037
2	Barun Chakraborty	Head Master	Palli Mangal Secondary School	01755055138
3	Sarif Hasibur Rahaman	Asst Teacher	Shahbag United Academy	01719672197
4	Shlapana Khanam	Asst. Teacher	Shahbag United Academy	01765876787
5	Salina Khanam	Asst Teacher	Palli Mangal Secondary School	0171115481
6	Sayed Habiba Alam	Asst. Teacher	Gobra Progoti Secondary School	01731498360
7	Md Nasir Uddin	Asst. Teacher	Palli Mangal Secondary School	01710121880
8	Apurba Kumar Bakshi	Head Teacher	Gobra proghoti Secondary School	01714634323
9	Md Solsad Fakir	SMC	Palli MangalSecondary School	01733982711
10	Al Akber Shekh	Assistant professor (SMC )	Chanchuri Purulia Secondary School	01932270477
11	Md Tajjul Islim	Asst. Teacher	Mulia High school	01724597685
12	Md Sultan Mahamud	Asst. Teacher	Gobra proghoti Secondary School	01712950875
13	Md Abu Abbase Munshi	SMC	Palli Mangal Secondary School	01762337031
14	Md Azizur Rahaman	SMC	Gobra Proghoti Secondary School	01915514168
15	Suuanker Biswas	Asst. Teacher	Chanchuri Purulia Secondary School	01718170087
16	Md Ifteher Alam	Asst. Teacher	Chanchuri Purulia Secondary School	01724240103
17	Sanjoy Kumar Biswas	Asst. Teacher	Shahbag United Academy	01715308900
18	Shanara Khatun	Asst. Teacher	Shahbag United Academy	01948914161
19	Md Wajad	District Manager	EPRC	01716095785
20	Md Yaqub Ali	Trainer	EPRC	01191160438
21	Abu Hassan	Research Officer	EPRC	01914693788
22	Anisur Rahaman	Research Officer	EPRC	01919812362