# Water Scarcity and its Conservation: An Action Project



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## Project Conducted by
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## Abstract:

*Water is life and water scarcity lead to death. Industrial civilization carries blessings along with inevitable curses. The water in which life was created, we've used up for our own needs, extends to depletion of water level in an incredibly fast pace. The aim of the present study is to use rain water and thus taking close to the concept of nature conservation. Rain water harvesting is the act of capturing rainwater and storing it for use as well as recharging it into the ground. RWH helps its users by reducing their dependence on piped or ground water, particularly in regions prone to droughts and water stress. A RWH system can be as simple as directing run-off water to garden beds or collecting it in a rain barrel. More complex systems may include gutters, storage tanks, pumps and delivery pipes. Schools have a vast catchment area consisting of not only building rooftops but also huge playgrounds that can generate large*

*volumes of run-off water. This exercise can make the students aware of the enormous benefits of implementing RWH systems on their premises. The result analysis shows that the present RWH system is having the storage of 2777.3 KL/year and 84.5% water demand can be met by rain water in school premises after doing the water footprint and water footprint of hidden water in food also. The developed system satisfies the social requirements and can be implemented in rural areas also.* ***Keywords:*** *Water scarcity, Industrial civilization, Rainwater harvesting (RWH), Nature conservation, Run-off water, Catchment area, Water conservation, Door to door survey, Water footprint, social requirements, Hidden water in food.*

## 1. Introduction:

Thirst-quieting cool, sweet and fresh water is the container and carrier of our life. The inorganic substances swirls in the bosom of the cosmos the source of the wonderful 'Blue Planet' and all living beings and origin of the first impulse of life. Hence the other name of water is life. Water is life and water scarcity lead to death. Water was in vapour forms at the time of Earth's creation. Over two hundred years, the surface of the Earth gets cooled and water vapour fall in the form of rain, creating oceans, seas, rivers, canals and water bodies. According to the scientists, life originated in the water which provokes the creation of unicellular, multicellular plants and much later animal kingdom.

This is how one day the forest was formed; human was born and civilization was created by human along various paths of evolution. Agricultural civilization came and then people started improving it by using science and technology. Then modern era came which is only 500 hundred years old. But the Earth was created at least 4.6 billion years ago. The use of water created in the primitive age of the Earth has been going on far as long. But industrial civilization carries blessings along with inevitable curses. The water in which life was created is the water that we've used up for our own needs, extends to depletion of water level in an incredibly fast pace. The third world war of the civilization is named as 'water war'.

But the three parts of the Earth is water and one part is land, then why is there such a shortage of water? Because there is insufficient storage of water in the Earth i.e. in the sea which is (91%) salty. Remaining 19% is fresh water most of which is in the form of ice at the North and South poles. Water for human uses comes from rivers, springs, streams, ponds and groundwater which is within 300 feet below ground level. This amount of water is 0.72% of the Earth's total water reservoir. After 1970-1980, a new face of water crisis emerged in India. Food yield increased. Due to the withdrawal of ground water – river, canals, ponds, streams, became empty during the entire country.

Scientists, environmental activists have started finding ways to get salvation from this crisis. We the "future generation" are very much worried about the water crisis. So, we are presenting a

project related to water to confine the wastage of water by making common men aware and conscious. We made a door-to-door survey in urban and rural area of our school community and calculate the water footprint of the individual, family and community. We talked to the service engineer of local municipality, the service providers like plumbers to know the water storage and distribution system of our school and local community.

## 2. Literature Review:

Water scarcity, an increasing global concern, demands a multifaceted approach that includes understanding the causes of scarcity and implementing efficient conservation techniques. Here's a breakdown of major themes in the literature that will influence design and action. It is also a significant issue in India, leading to numerous commissions and committees to examine and propose solutions. This assessment reviews the important suggestions made by these bodies. A case study conducted by Phadke and colleagues between 1997 and 1998 exemplifies the lack of sustainability and justice in natural resources such as fresh water and draught scenes in the Baliraja Memorial Dam area.

Boyer and colleagues used two open-access lexicometric software to perform a quantitative textual analysis of 520 daily local press stories about drought and water challenges in Phoenix and Tucson (Arizona, USA). Their analysis examines the emergence of the water conservation story in the news, demonstrating how the media can be used to promote public policies and increase social support. Water conservation is presented as a voluntary tool. It tells that water scarcity problems would be successfully addressed to support urban growth in dry locations. The remaining references provide context for the enormous amount of work done by scientists, as well as various other individuals in our society and environmental activists, to investigate long-term solutions to the water crisis and the right to water acts, which prioritize water for fundamental requirements. As a result, we were encouraged to work on this particular project.

## 4. Objective of the Project:

i) To assess the water scarcity by analyzing water availability, demand and usage pattern.
ii) To develop sustainable water management plants in school premises as well as in the household system.
iii) To raise awareness and advocacy amongst the students.
iv) To build resilience to climate change amongst the community.
v) To promote community engagement via students.

## 5. Methodology:

### 5.1 Study Area:

Our school is in Barrackpore region of North 24 PGS. River Hooghly lies in the west of N 24 PGS. Bangaon and Ichamoti river are located in the east, Nadia dist. is in the north and south 24 PGS and Kolkata are in the southern part of our district and school also. Graphical location of Barrackpore: Latitude 22.7661-degree North; Longitude 88.3516-degree East

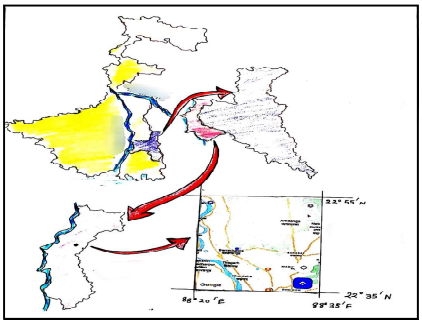


Figure-1: Map of west Bengal, North 24 PGS and Barrackpore

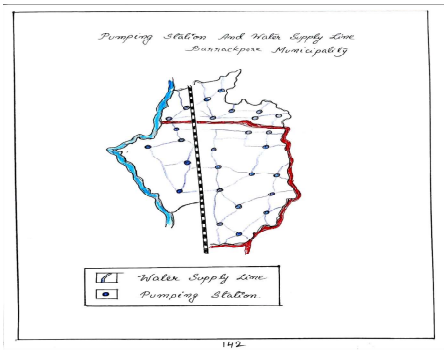



Figure-2: Map of North Barrackpore Municipality

Table-1: Demography of the studied area:[1]

| Total Population | Male | Female | Rural | Urban | Density | Literacy Rate | Sex Ratio Female: Male |
|---|---|---|---|---|---|---|---|
| 194,333 | 99,434 | 94,899 | 94,278 | 100,055 | 11,058 | 88.76% | 950 : 1000 |

## 5.2 Study Tools:

i) Literature review
ii) Surveys and questionnaire
iii) Interviews: some salient features have been considered at the time of interview- (a) Impact of water scarcity, (b) conservation strategies, (c) role of individuals and communities, (d) challenges and barriers, (e) future outlook, (f) expert opinions, etc.

By covering these aspects, the interview has been conducted.

i) Case study and observations
ii) Water footprint assessment
iii) Field survey
iv) Random sampling
v) Mathematical modeling and statistical analysis and content analysis
vi) Software tools like Microsoft word and excel

## 5.3 Design of the Study:

i) Door to door sample survey both in the urban and rural area was used to study the usage and demand of the water in household work.

[1] Census 2011

ii) Interviews with the farmers were used to study about hidden water in food.
iii) Individual and family sample survey among students of secondary level was used to measure the water footprint of the individuals, family and community.
iv) Interviews with the service engineer of the local municipality and service provider of the school were used to understand the distribution system of the water supply.
v) School catchment area of rain water has been calculated by using simple measurement by measuring tape and then calculated by using simple formulae.

### 5.4 Sample Design & Technique:

The present study deals with the population as secondary school students and their family of Nawabganj Balika Vidyalaya situated in North Barrackpore Municipality (North 24 PGS) and the neighboring community as urban area. Siuli Gram Panchayat selected as the rural community. For taking the sample, investigators randomly selected the families from the above-mentioned areas in Table-1.

Table -2: Distribution of Sample

| Students of class X | Family | | Total Individual |
|---|---|---|---|
| | Rural | Urban | |
| 11 | 17 | 4 | 85 |

### 5.5 Fieldwork Planning:

Questionnaire has been made for door-to-door survey and interviews. Investigators have been trained on data collection procedures, maintaining protocols for approaching households and obtaining consents and also have been trained to measure the catchment area of the school. Interviews were done in the school hours, i.e., from 10.30 a.m. to 4.30 p.m. in the month of September in 2023.

## 6. Study Conducted, Data Collection and Data Analysis:

The Project was conducted towards measuring the 'Water Footprint'. The Process of conducting the Study, Methods, Collections of Data and Analysis of Collected Data and Interpretations are given below.

### 6.1 Water Footprint:

#### 6.1.1 Methods:

The basic methodology of any water footprint involves evaluating the source, calculating the consumption, identifying the losses and measuring the performance indicators.

We have first collected the water usage data in individuals, family, community and school campuses. Charts have been prepared, which are used to develop mathematical models. From the modelling we have come to the conclusion regarding the source, wastage and conservation

of water for the future. It also helps us to create awareness on simple conservation methods such as fixing leakages of taps and turning off taps while soaping hands.

### 6.1.2 Calculation of Water Consumption:

#### i) Calculation of the capacity of a mug:

We have used a 500 ml bottle to fill the mug till the brim. It is found that the capacity of the mug is 500 ml X 2 = 1000 ml or 1 liter

#### ii) Calculation of capacity of a bucket:

To estimate the quantity of water the bucket can hold, we have used the previously measured 1 liter mug. It is found that the capacity of the bucket is 28 liters.

#### iii) Calculation of Flow rate of water from taps:

We have filled a 1 liter mug up to the brim by opening the tap completely and the time taken is measured using a stopwatch.

Flow rate = Time taken for mug to fill up fully ÷ 60

= 7.5 ÷ 60 = 0.125 L/min

Water usage for hand washing has been calculated from the flow rate.

#### iv) Calculation of quantity of water lost in leakages:

A tap is leaking and fills a 1-liter mug in 22.5 min.

Quantity of water lost by leakage in a day

= water lost in a minute X 60 X 24

$= \frac{1}{22.5}$ X 60 X 24 = 64 L

#### v) Calculation of the quantity of water used in a Flush Toilet:

After shutting off the water supply valve, the toilet is flushed. Then the flush tank is filled with the help of a 1-liter mug. It is found that the capacity of the flush tank is 20 liters.

Table-3: Individual Water Footprints

| Student's Serial No. | Water Consumption (L) | | | | | Daily Total water consumption (L) | Monthly Total water consumption (L) |
|---|---|---|---|---|---|---|---|
| | Brushing and mouth washing (L) | Toilet (L) | Drinking (L) | Bathing (L) | Hand washing after eating (L) | | |
| 1. | 1 | 10 | 3 | 20 | 0.5 | 34.5 | 1035 |
| 2. | 0.5 | 8 | 4 | 18 | 1.5 | 32 | 960 |
| 3. | 2 | 7 | 3.5 | 18 | 1 | 31.5 | 945 |
| 4. | 0.9 | 4.5 | 3 | 6 | 2 | 15.14 | 454.2 |
| 5. | 0.75 | 8 | 1.5 | 20 | 1 | 30.8 | 924 |
| 6. | 1 | 9 | 5 | 15 | 0.7 | 30.7 | 921 |
| 7. | 1 | 6 | 3 | 15 | 1.5 | 26.5 | 795 |

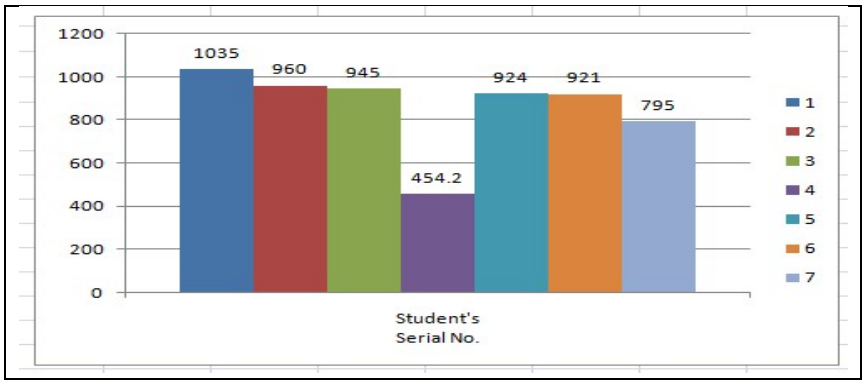



Figure-3: Graph of individual footprint

Table-4: Family Water Footprints

| Students Family Serial No. | Family Members | Water Consumption (L) | | | | | | | Daily Total Water usage (L) | Monthly total water usage (L) | Yearly total water usage (KL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Toilet (L) | Bathing (L) | Cooking (L) | Dish Washing | Washing clothes (L) | Floor Cleaning (L) | Gardening (L) | | | |
| 1. | 3 | 30 | 60 | 10 | 4 | 4 | 20 | .80 | 128.8 | 3864 | 46.3 |
| 2. | 4 | 32 | 54 | 3 | 14 | 10 | 3 | - | 116 | 3480 | 41.7 |
| 3. | 4 | 28 | 54 | 15 | 40 | 20 | 2.7 | - | 163.7 | 4911 | 58.93 |
| 4. | 3 | 13.5 | 18 | 1 | 2 | 20 | 2 | 1.2 | 60.7 | 1812 | 21.74 |
| 5. | 3 | 24 | 60 | 5 | 18 | 17 | 6 | 2 | 132 | 3960 | 47.5 |
| 6. | 4 | 31 | 35 | 8 | 22 | 18 | 4 | - | 118 | 3540 | 42.4 |
| 7. | 6 | 36 | 90 | 10.5 | 25 | 35 | 5 | - | 201.5 | 6045 | 72.5 |

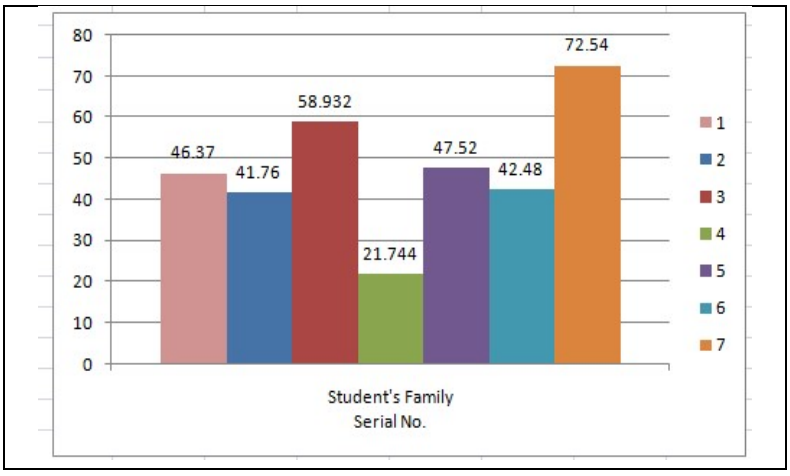



Figure-4: Graph of family water footprints

Table-5: Community Water Footprints

| Sl. No. | Family Members | Water Consumption (L) | | | | | | | Daily water usage (L) | Monthly water usage (L) | Yearly water usage (KL) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Toilet (L) | Bathing (L) | Cooking (L) | Dish Washing (L) | Cloth Washing (L) | Floor Cleaning (L) | Gardening (L) | | | |
| 1 | 4 | 6 | 70 | 18 | 20 | 6 | 6.5 | 10 | 136.5 | 4095 | 49.14 |
| 2 | 2 | 10 | 20 | 5.5 | 5 | 20 | 5 | 2.5 | 68 | 2040 | 24.48 |
| 3 | 5 | 3.5 | 20 | 10 | 5 | 20 | 20 | 5 | 83.5 | 2505 | 30.06 |
| 4 | 1 | 3 | 7.5 | 2.5 | 2 | 2 | 1 | - | 18 | 540 | 6.48 |
| 5 | 4 | 5 | 60 | 15 | 12 | 5 | 6 | - | 103 | 3090 | 37.08 |
| 6 | 6 | 50 | 60 | 20 | 15 | 10 | 10 | 50 | 215 | 6450 | 77.4 |
| 7 | 5 | 60 | 100 | 10 | 20 | 10 | 10 | - | 210 | 6300 | 75.6 |
| 8 | 4 | 72 | 72 | 4 | 25 | 35 | 18 | - | 226 | 6780 | 81.36 |
| 9 | 3 | 36 | 35 | 2 | 32 | 70 | 20 | - | 195 | 5850 | 70.2 |
| 10 | 5 | 15 | 60 | 0.5 | 7.5 | 15 | 10 | - | 108 | 3240 | 38.88 |
| 11 | 4 | 60 | 40 | 0.75 | 30 | 60 | 15 | - | 205.75 | 6172.5 | 74.07 |
| 12 | 2 | 36 | 36 | 2 | 12.5 | 17.5 | 9 | 5 | 118 | 3540 | 42.48 |
| 13 | 3 | 40 | 45 | 3 | 40 | 50 | 40 | 7.5 | 225.75 | 6765 | 81.18 |
| 14 | 1 | 18 | 18 | 0.5 | 2.5 | 18 | 18 | 1.2 | 76.7 | 2286 | 27.432 |

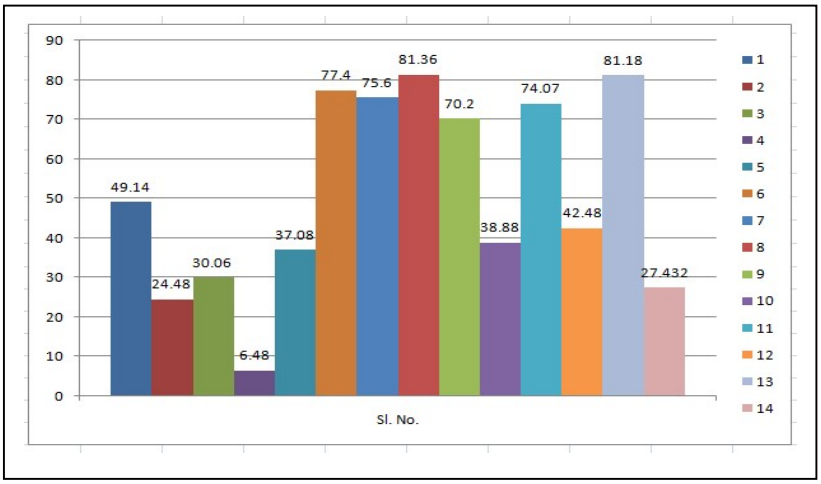



Figure -5: Graph of community water footprints

Table-6: Water Footprint of School Campus

| Drinking Water (L) | Toilet & Hand Washing (L) | Cooking (L) | Dish Washing (L) | Floor Cleaning (L) | Gardening (L) | Daily water usage (L) | Monthly water usage (KL) | Yearly water usage (KL) |
|---|---|---|---|---|---|---|---|---|
| 700 | 5400 | 200 | 1000 | 200 | 1500 | 9000 | 27 | 3240 |

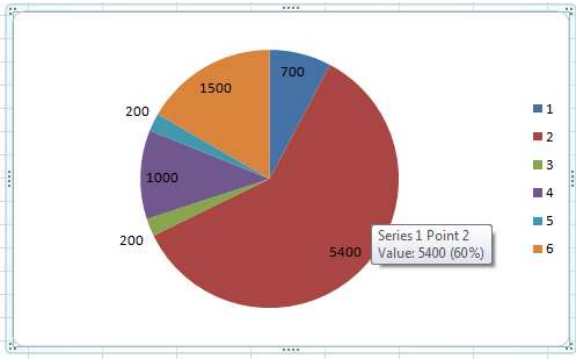



Figure-6: Graph of Water footprint of School Campus

## 6.2 Water Footprint of Virtual Water:

### 6.2.1 Hidden Water in Food:

The amount of water needed for our daily life doesn't always appears in front of us. It is not necessary that we can see it through our naked eyes. Have we ever thought about the amount of water utilized for the production of our mobile phone, water needed for producing the dress we wear, the road we travel through or the processed food in the packets. We must think of the water needed to produce the fish, meat, egg or milk or consume.

Water footprint is an environmental indicator that measures the volume of fresh water needed to produce the goods and services demanded by society. It is the volume of fresh water used throughout the entire production chain of a consumer item or service. To understand the 'water footprint' of hidden water in food also we five friends calculated the 'water footprint' of any one of our main meals.

Table-7: Calculation of Hidden 'Water-Footprint' in case of Student No. 1

| Ingredients used to Prepare the meal | Quantity required Kg or Liters (x) | Water footprint Per unit of food item (y)[2] | Water footprint 'Liters' (xy) |
|---|---|---|---|
| Rice | 1.2 Kg | 3571 | 4285.20 |
| Egg | 0.2 Kg | 3265 | 653 |
| Potato | 0.75 Kg | 277 | 207.75 |
| Tomato | 0.25 Kg | 380 | 95 |
| Onion | 0.25 Kg | 272 | 68 |
| Ginger | 0.075 Kg | 1657 | 124.275 |
| Garlic | 0.05 Kg | 589 | 29.45 |

*Total = 5462.675 liters*

*No. of family members = 3*

$$\therefore \textit{Water footprint per person} = \frac{5462.675}{3} = 1820.892 \textit{ litres}$$

[2] Booklet of Wipro Sustainability and water

Table-8: Calculation of Hidden 'Water-Footprint' in case of Student No. 2

| Ingredients used to Prepare the meal | Quantity required Kg or Liters (x) | Water footprint Per unit of food item (y) | Water footprint 'Liters' (xy) |
|---|---|---|---|
| Rice | 0.4 Kg | 3571 | 1428.4 |
| Pulse | 0.05 Kg | 3984 | 1992 |
| Potato | 0.6 Kg | 277 | 166.2 |
| Tomato | 0.3 Kg | 380 | 114 |
| Onion | 0.3 Kg | 230 | 69 |
| Cauliflower | 0.05 Kg | 233 | 11.65 |
| Chicken | 1 Kg | 4325 | 4325 |

Total = 6313.45 litres

*No. of family members = 3* $\therefore$ *Water footprint per person* $= \frac{6313.45}{3} = 2104.483$ *litres*

Table-9: Calculation of Hidden 'Water-Footprint' in case of Student No. 3

| Ingredients used to Prepare the meal | Quantity required Kg or Liters (x) | Water footprint Per unit of food item (y) | Water footprint 'Litters' (xy) |
|---|---|---|---|
| Rice | 0.4 Kg | 3571 | 1428.4 |
| Soyabean | 0.5 Kg | 7121 | 3560.5 |
| Potato | 0.2 Kg | 277 | 55.4 |
| Pointed gourd | 0.3 Kg | 336 | 100.8 |
| Milk | 0.5 litre | 1789 | 894.5 |

*Total = 6040.6 liters*

No. of family members = 3 $\therefore$ Water footprint per person $= \frac{6040.6}{3} = 2013.53$ litres

Table-10: Calculation of Hidden 'Water-Footprint' in case of Student No. 4

| Ingredients used to Prepare the meal | Quantity required Kg or Liters (x) | Water footprint Per unit of food item (y) | Water footprint 'Liters' (xy) |
|---|---|---|---|
| Rice | 0.4 Kg | 3571 | 1428.4 |
| Pulse | 0.2 Kg | 3985 | 796.8 |
| Potato | 0.2 Kg | 277 | 55.4 |
| Pointed gourd | 0.3 Kg | 336 | 100.8 |
| Chicken | 0.5 Kg | 4325 | 2162.5 |

Total = 4543.9 liters

No. of family members = 3 $\therefore$ Water footprint per person $= \frac{4543.9}{3} = 1514.6$ litres

Table-11: Calculation of Hidden 'Water-Footprint' in case of Student No. 5

| Ingredients used to Prepare the meal | Quantity required Kg or Liters (x) | Water footprint Per unit of food item (y) | Water footprint 'Liters' (xy) |
|---|---|---|---|
| Rice | 1.5 Kg | 3571 | 5356.5 |
| Potato | 1 Kg | 277 | 277 |
| Cauliflower | 0.5 Kg | 285 | 142.5 |
| Tomato | 0.25 Kg | 380 | 95 |
| Onion | 0.25 Kg | 280 | 70 |
| Ginger | 0.05 Kg | 1657 | 82.85 |

Total = 6023.35 liters

*No. of family members = 4* $\therefore$ *Water footprint per person* $= \frac{6023.85}{3} = 1505.96$ *litres*

Therefore, it can be concluded that the water footprint of vegetarian diet is comparatively much less than non-vegetarian diet, because in case of animal protein water is needed to roar the animals, as well as water is needed to grow the fodder crops (to feed the animals) and to produce fuel for the vehicles which is used to transport the fodder from the field.

Figure-7: Door to Door Survey: *Siuli Gram Panchayat and School Community, Barrackpore*

Photograph-1: Interview
*Service Engineer, North Barrackpore Municipality*

Photograph-2: Interview
*Service Proiver, School Campus*

## 6.3 Rain Water Harvesting Potential in School Campus:

Rain water harvesting (RWH) is the act of capturing rainwater and storing it for use as well as recharging it into the ground. RWH helps its users by reducing their dependence on piped or

ground water. A RWH system can be as simple as directing run-off water to garden beds or collecting it in a rain barrel. More complex systems may include gutters, storage tanks, pumps and delivery pipes.

School has a vast catchment area consisting of not only building rooftops but also huge playground that can generate large volumes of run-off water. This exercise can make the students aware of the enormous benefits of implementing RWH systems on their premises.

### 6.3.1 Method of Calculating the Catchment Area:

The total catchment area of the school roof top has been calculated-

Total area of the Building-1

= [10 X 15 + 12 X 15 + (31.5 – 15) X (10 + 12 + 12) – $4^2$] Sq. Meter
= (150 + 180 + 561 – 16) Sq. Meter = 875 Sq. Meter

Total area of the Building-2

= [(14.7 X 11) + (9 X 6)] Sq. Meter
= (161.7 + 54) Sq. Meter = 215.7 Sq. Meter

∴ Total catchment area of the school
= (875 + 215.7) Sq. Meter
=1030 .7 Sq. Meter

Then we calculated the total paved area and unpaved area of the school.

Total unpaved area of the school

= (15 X 12 + 100 X 200) Sq. Meter
= (180 + 2000) Sq. Meter
= 2180 Sq. Meter

Total paved area of the school

= [(5.5 X 4) + (14.7 X 3.5)] Sq. m.
= (22 + 51.45) Sq. Meter
= 73.45 Sq. Meter

Table -12: Calculation Table of Potential Harvestable Rainfall in School Campus

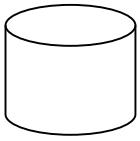
| Types of Catchment | Built area (Sq. Metre) | Open area (Sq. Metre) | |
|---|---|---|---|
| | Roof Area | Unpaved area | Paved area |
| Building 1 | 875 | 180 | 73.45 |
| Building 2 | 215.7 | 2000 | - |
| Total annual of rainfall | 1410 mm | | |
| Run off coefficient[3] | 0.8 | 0.1 | 0.5 |
| Total rainfall Captured (KL) | 1230 KL | 1536.9 KL | 10.4 KL |
| | Total water captured = 2777.3 KL | | |
| Total estimated Water demand | 3285 KL | | |
| Percentage of demand that can be met by rain water | 84.5% | | |

### 6.3.2 Measurement of Average Rainfall:

At first, we measured the volume of rainfall for 15 days in the month of August. Then we measured the radius of the base of a bucket / bottle.

Volume of a right circular cylinder –

= Area of the base X Height = $\pi r^2 h$



We assumed each of the measuring equipment as a right circular cylinder. Then equating the average rainfall for 15 days (taking in consideration the rainfall on 24 hrs/day) with the volume of cylinder $\pi r^2 h$, height 'h' can be obtained. In this way we calculated the annual average rainfall of the area.

### 6.3.4 Findings and Discussions:

The result analysis shows that the potential RWH system is having the storage of 2777.3 KL/year and 84.5% water demand can be met by rain water in school premises and is reasonably well in comparison with conventional water sources. The system can satisfy the social requirements and can be implemented in rural areas by considering almost all the technical aspects.

Photograph-3: Measurement of school catchment area

Photograph-4 Measurement of water consumption

[3] Run off co-efficient has been calculated by using the booklet of Wipro Sustainability and water

## 7. Findings of this Project:

There is something magical about the nature but only human beings can perform tricks. A trick shows up only for a moment but it takes years of perseverance to perfect the art to the tee. The 'Drinking Water Scarcity' has become a universal problem. Every plausible solution to this problem demands an overall effort from all the stakeholders. Water- agriculture- environmental pollution - these are related to each other. Not only agriculture but other sectors like industry, technology also depend heavily on availability of water. Considering the demand-supply gap of potable water, conservation of water becomes the need of the hour. Worldwide, people with scientific temperament have started a revolution to conserve water on a war-footing. This revolution is for saving lives by saving the environment.

From awareness to action – the beginning of road of resistance is the 'Sustainability and Water' project that helped us to realize the practical horror of water scarcity. It is time to work towards figuring out a practical solution by making sure participation of all stakeholders – academicians, students, engineers, menial labors, politicians, policy makers, household, and folks and so on. Our teachers have given us the opportunity to dig deeper into the problem and find the solution. As future citizens it is our responsibility to make sure that everybody understands the value of water.

Through the course of this project, the students have learnt to respect water as a 'resource'.

- Learnt new concepts like direct and indirect use of water, 'hidden water', 'water footprint', 'water inequality', etc.
- Learnt about the water-intensive sectors. The highest water consuming sector is agriculture.
- Carried out inspection of local water sources – both natural and artificial.
- Observed the sanitation system of towns situated on the banks of the Hooghly River.

The teachers have taught us to use the available tools and methodology of survey and data collection. They have played an active role in forming 'Jal Sena' (Water Warriors) consisting of the students. The 'Jal Sena' is actively taking part in –

- Stopping drinking water wastage at school premises by closing the tap after use, repairing leakages in the pipeline.
- Cleaning the classrooms and corridors with brooms and clothes, instead of using water.
- Harvesting rainwater with tubs, buckets, etc.
- Constructing rainwater harvest infrastructure on the terrace.

- Tree plantation around the school premises.
- Using moist hays, leaves to cover the roots of the trees to reduce the rate of evaporation.

Last but not the least, we taught our classmates the lessons we learnt during the course of the project.

It is everyone's foremost duty to incorporate those lessons into their daily habits. To bridge the gap between academic knowledge and household practices the followings can be adapted –

- efficient use of the taps,
- repairing leakages in pipeline,
- measured use of water during household chores and in toilet (like using tub and mug to bathe, instead of shower)
- recycling 'gray water' to water plants or wash toilet,
- Rainwater harvesting and using it in household chores,
- Reduce wastage of food and other resources. Adopting 'minimalist' lifestyle.
- Consuming seasonal fruits and vegetables.
- Reduce 'one time use' items.

Consider it to be the duty of each 'Jal Sena' to adopt and promote the 'R4 (Reduce-Refuse-Reuse-Recycle) lifestyle'. We hope that the relevant authorities, such as the Urban Local Bodies, Administration, will take notice of our effort and help us in achieving the goal of 'conservation of pollution-free drinking water'.

Observe 22$^{nd}$ March as the International Water Day and 14$^{th}$ April as the National Water Day but conservation of water is a challenge on every day. We have to address bigger issues, such as cultivating water-intensive crops, wastage of water in primary sector, contamination of water from industry and agricultural fields, water poverty, water inequality, etc. These problems demand innovative solutions. Technological intervention, political will along with participation of all the stakeholders – that is the only solution to save the 'Blue Planet'. There is already a price tag on drinking water. We have to learn the 'trick' to reserve the current course of action before water, which is a public good, becomes a 'commodity' for a chosen few.

## 8. Limitations:

i) The study is limited for the school students and the local community.
ii) The study is limited to resources, scope and technical expertise.

## 9. Suggestions for the Further Study/ Project:

i) To deepen the understanding of water scarcity and conservation, a study on impact of climate change on water availability, analyzing water management policies in different regions, examining the role of technology in water conservation efforts can be done.

ii) A further study can be done on investigating community-based approaches to sustainable water usage.

## 10. Conclusion:

In conclusion, the action project undertaken by our school students and teachers on water scarcity and conservation has been a commendable endeavour. Through hands-on initiatives, field works, educational campaigns, and community engagement, they've demonstrated a deep understanding of the challenges posed by water scarcity and the importance of conservation efforts. Their dedication serves as an inspiration to us all, highlighting the power of youth-led action in addressing pressing environmental issues. Moving forward, let us continue to support and empower our students as they pave the way for a more sustainable and water-resilient future.

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