CHAPTER 4: STUDY ON DRINKING WATER INFRASTRUCTURE OF SCHOOLS

The outline of this chapter is drawn from the previous chapter in two sections, in the first section the researcher analyzes the drinking water infrastructure in detail to identify the variables of drinking water infrastructure and then derives the cost of the identified variables. Outset of the section gives the brief introduction on the infrastructure and followed by addressing the primary objective and Secondary objectives of the study. The second section of the chapter analyzes the teachers' and students' perception of various parameters of drinking water infrastructure using the Likert scale questionnaire and Cronbach's Alpha statistical tools to arrive at conclusion.

SECTION-I

DRINKING WATER INFRASTRUCTURE IN SCHOOLS

4.1 INTRODUCTION

Economic growth and development of every nation depends on its infrastructure development. It is considered a decisive factor for the overall economic growth of the nation. Economic infrastructure is growing at a significant rate, private or government sector playing a vital role. On the other hand, social infrastructure in India calls for special attention in the area of education, health, sanitation, housing, and water supply. Water infrastructures is the central to economic and social infrastructure, as no industry or segment works without water resources. The sound economic and social infrastructure enhances the quality of human resources and thus improves proficiency of manpower. At the same time, it is also true that without economic growth sustained improvement in human well-being is not possible. Therefore, developing the country's water infrastructure is one of the top priorities of the government. The government has taken many initiatives for developing better and quality infrastructure in the country.

India can still store only relatively small quantities of its rainfall, whereas arid rich countries (such as the United States and Australia) have built over 5,000 cubic meters of water storage per capita, and China can store about 1,000 cubic meters per capita, India's dams can store only 200 cubic meters per person. Moreover, India can store only about 30 days of rainfall, compared to 900 days in major river basins in arid areas of developed countries (Smartgen, 2020)

Water Infrastructure

Water infrastructure is a broad term for systems of water supply, treatment, storage, water resource management, flood prevention and hydropower. The term also includes water-based transportation systems such as canals (Spacey, 2017). A community's water infrastructure includes all the man-made and natural features that move and treat water. While holistically it is all part of the same system, it is often convenient to think about infrastructure in terms of drinking water, wastewater, and storm water (EPA, 2022).

The drinking water infrastructure includes many parameters like number of groundwater wells, surface-water inlets, reservoirs, dams, tanks for storing water, facilities relating to drinking water, pipes, and aqueducts. In Section-I of the research study details the drinking water infrastructure.

A healthy hydration is a cardinal right of every school child. A considerable part of their day is spent by students at their school. So, it becomes very important for them to have access to safe drinking water for cognition, and their overall health. The schools along with imparting education and knowledge, also need to fulfil many other duties. The schools are accountable for providing clean and safe drinking water to students and staff.

At school level drinking water infrastructure includes not just the water storage tank but also incorporates R.O, water coolers, taps etc. for which certain investment is needed. To use drinking water more effectively in the schools they need to invest in some basic infrastructure.

Study finds out the various types of factors involved in providing drinking water in the educational institutions, particularly in the Vadodara city. Eighty schools are surveyed using scheduled questionnaire and observation through taking picture of the drinking water facility available in the selected school. Scheduled questionnaire covers the major factors forming as a part of drinking water infrastructure, the factors are classified as fixed and variable. The classifications of the factors are done on the basis of the time period i.e., short time period, within one year and long time period, more than one year. The following are the dimension covered for classification of factors, Fixed Factors i.e., Drinking water Tank, Taps, Purifier, Water cooler, Hand Pump, Water Motor and Variable Factors i.e., labour, Purifier Filter, Electricity, Bleaching powder (cleaning purpose)

4.2 PROFILE OF RESPONDENTS

The data collection of the schools gives the socio- economic information of the selected schools of the Vadodara city. The brief data analysis of the socio- economic information is discussed below:

Table 4.1

Type of School

School	Frequency	Percent
Private	38	47.5
Government Funded	42	52.5
Total	80	100.0

Source: Computed by the researcher through primary data collection

The above Table 4.1 shows the types of selected schools of the Vadodara city. The schools belonged to two different categories i.e., Private and Government funded schools. The data shows 47.5 percent of the schools were private and 52.5 percent were government funded schools. The distribution of the frequency shows that the data collected is unbiased on the types of school.

Table 4.2

Schedule of the Schools

Schedule	Frequency	Percent
Morning	58	72.5
Afternoon	22	27.5
Total	80	100.0

Source: Computed by the researcher through primary data collection

Table 4.2 shows the data collected of the selected schools is analyzed on the basis of timing of their schedule and shows that 27.5 percent of the schools are functioning in the afternoon session and the 72 percent of the selected schools are operating in the morning session. The data collection on infrastructure of drinking water remains the same irrespective of the time of the school. So, the timing of the schools doesn’t have any affect on the data related to drinking water infrastructure.

Table 4.3

Mid-Day Meal

Meals Provided	Frequency	Percent
No	49	61.3
Yes	31	38.8
Total	80	100.0

Source: Computed by the researcher through primary data collection

Mid-day meal program was launched in 1995 by Akshaya Patra, provides regular meals to 2 million children in Government schools across India. It is designed for better nutritional standing of the school age children national wide (Poshan, n.d). The Table 4.3 provides information about the mid-day meal facilities. It is visible that 61.3 percent of the schools did not have mid-day meal system in their schools. Only 38.8 percent schools had mid-day meal scheme they were government schools. This meal facilities are provided for primary students. Private schools also provide meal facilities on the payment basis to their students (included in fees).

Table 4.4

The Student, Teacher, Non-Teaching Staff and Housekeeping Staff

Particulars	N	Minimum	Maximum	Mean	Std. Deviation
Total number of students studying in the school	80	20	3500	584.74	690.716
Total number of teaching staff in the school	80	2	150	23.09	29.308
Total number of non-teaching staff in the school	80	0	50	7.25	11.056
Total number staff kept for housekeeping work in the school	80	0	100	6.73	13.384

Source: Computed by the researcher through primary data collection

The Indian schooling system caters more than 250 million students and makes it worlds largest schooling system. Indian schooling system is managed by government and private bodies. Student enrollment of the year 2018, in private schools was 119 million whereas 131 million in government school (Kanwal, 2021).

The Table 4.4 gives the information about the total number of students, teachers, non-teaching, and house- keeping staff of the school. The data shows that the minimum number of the student's strength of selected schools were 20 and the maximum was 3500 students. The average enrollment of the students in the school was 585 approx. The data shows that the information covered in the survey consider all sizes of the schools. The schools with small, medium, and large number of students are covered under the survey to make sure that drinking water infrastructure of every kind of school should be covered to answer the research questions. The average number of the teachers employed were approx. 23 for the selected schools.

Total number of non-teaching staff shows zero (0), which means that there are some schools with no non-teaching staff, and maximum number of non-teaching staff is 50 with standard deviation of 11.056.

Another important analysis of data collected on number of housekeeping shows zero (0) in some schools and 100 in some schools. The average number of the housekeeping of the selected schools shows 6.73 labours are required for cleaning with standard deviation of 13.384.

The data on non-teaching and housekeeping staff shows that there is question on cleanliness of drinking water in particular with Zero staff. Therefore, it can be concluded that more housekeeping staff means more cleanliness in the school. Investment in drinking water infrastructure by schools will definitely improve the well-being of student and teaching staff. To test the association between number of housekeeping staff in government and private schools the following hypothesis test was run.

$H0_1$: There is no significant difference between the number of housekeeping staff and the type of school.

Result:

Table 4.5

Group Statistics

	School	N	Mean	Std. Deviation	Std. Error Mean
Total number staff kept for housekeeping work in the school	Private	38	11.05	18.357	2.978
	Government	42	2.81	2.830	.437

Source: Computed by the researcher through primary data collection

Table 4.6

Independent Samples Test

	t-test for equality of means			
	T	DF	Sig. (2-tailed)	Mean Difference
Number housekeeping staff	2.875	78	.005	8.243

Source: Computed by the researcher through primary data collection

The average number housekeeping staff kept for cleaning the school by private schools are compared with the average number of housekeeping staff kept by government schools

For the result output, Table 4.6 analysis shows that P value (.005) is less than significance value. So, the Null hypothesis was rejected. The results show that there is a significant difference between government schools and private schools in terms of number housekeeping staff kept for cleaning. The private schools were having a greater number of housekeeping staff in comparison to government. It implies that private schools were more concerned about the cleanliness of the overall school infrastructure including drinking water in comparison to government funded schools.

The upcoming section discusses the detailed analysis of data on the various dimension of drinking water infrastructure of the selected schools on fixed and variable factors are discussed aligned with the objective addressed as follows:

The Primary Objective 1: To identify the Drinking water infrastructure in the selected educational buildings of Vadodara City of Gujarat state.

4.3 FIXED FACTORS

Fixed factors do not change with change in output. A discussion about the fixed determinants of the drinking water infrastructure is as follows:

4.3.1 Drinking water Tank

Water tanks are basically classified into two categories for storing water for drinking purpose: Ground Water Tank and Elevated Water tanks.

Ground Water Tanks

Groundwater tanks suit perfect for those who wish to economize space. It also adds protection from natural and manmade damages and thefts. The following are the Pros and Cons of Groundwater tank (National Storage Tank, 2019).

Pros of the Ground Water Tanks

- Construction of groundwater can save the space of the real estate and preserve more space, which can be used for various other useful purposes. This type of tank is not visible to anyone and has no complain from neighbours for disturbing the looks of the others property. It can be constructed on a large scale.
- Irrespective of the seasons the groundwater tank maintains the temperature of water throughout the year.

Cons of Underground Water Tanks

- Major cost of installing the underground tank means lot of digging work which means more money. In addition to this need further installation of pumping systems makes it very costly.
- The problem of leakage and cracks are difficult to identify which can risk the water with contamination

Overhead Water Tank

Overhead tanks are gaining popularity in the present scenario. The tanks which are constructed or installed above the surface are known as overhead tanks or elevated tanks. Generally, these types of tanks are installed on the roof top. These tanks are easy to install and has its own pros and cons.

Pros of Overhead Water Tank

- The overhead tanks are less expensive in comparison to underground water tanks with respect its installation.
- Overhead water tank is easy to monitor and quick to solve the problem. It is easy to maintain and identify the problems like cracks and leakage. Monitoring and inspection can be done easily. Thus, these features of overhead tank make it less costly and easy to maintain.
- The overhead water tank be used for appearance purpose for advertising their business name or other things. The architecture of the water tank enhances the beauty of the building.

Cons of Overhead Water Tank

- It is very difficult to maintain the temperature of the stored water in the elevated tanks due to the change in the seasons. In the winter its so cold whereas in summer its too hot. Generally, the overhead ground water tanks are relatively smaller than underground water tanks. Thus, this type of water tank is best for meeting the requirement in times of emergency.
- Government regulation according to zone (unsaturated zones, capillary fringe, watertable and saturated zone) has to be adhered, spill check on water, preventing theft, vandalism, and containment protocols.

Choosing a Water Storage Tank

Selection of the types of water tank is completely on the management, but the decision should be taken keeping the safety factors, low cost of installation and ease of installation (National Storage Tank, 2019). In the upcoming section the researcher has discussed the types of tanks used in the schools during the survey.

During the survey it was found that the schools are using overhead water tanks for drinking infrastructure. In the informal discussion it was found that plastic tanks were installed in addition to the RCC tanks to increase the capacity and meet the emergency needs, the Plastic tanks and RCC (Reinforced Cement Concrete) which are discussed briefly.

Plastic water storage tanks are relatively lightweight, installing and moving these tanks is fairly easy, unlike a RCC (Reinforced Cement Concrete) tank which is typically so heavy that it needs to be moved and installed with the assistance of a crane, plastic tanks can be simply moved with hands without much trouble. It is difficult for RCC tanks to move, and it is generally observed that once fixed these can't be moved (Vectus,2021).

There are diverse categories of water tanks that serve diverse purposes. One has to be watchful while storing drinking water, one exclusively does not want to store drinking water in vessels as it could make the water hazardous. Individual has to determine what type and size of water tank is best suits the requirement.

This segment analyses of Size and Type of water tanks available in selected schools, Table 4.7 gives the information on the size and type of the water tank were collected.

Table 4.7

The Type of Drinking Water Tank

Type	Frequency	Percent
A- Concrete Water Tank	43	53.8
A &B	3	3.8
B- Plastic Water Tank	32	40
E- Other Type	2	2.5
Total	80	100

Source: Computed by the researcher through primary data collection

Figure-4.1

The Type of Drinking Water Tank

A- Concrete Water Tank

B- Plastic Water Tank

Source-Indiamart.com

It is found that the majority of the selected schools are using type A category of water tank, more than 50 percent of the schools are using type A tanks followed by type B using 40 percent and only few schools are seen with type A and B totaling to only 3. Only 2.5 percent of the school used other type of tanks.

The RCC tanks are traditional architecture, famous and in trend since the beginning of the construction era. The schools were also established years back and following the then practices. Recently, with the change in time and competitive markets new types of products have entered into the market replacing the old one. It was revealed during the survey the tanks capacity in the schools was increased in the recent past due to increase in enrolments.

Table 4.8

The Size of Drinking Water Tank

Capacity (litres)	Frequency	Percent
700	1	1.3
1000	18	22.5
1500	2	2.5
2000	15	18.8
2500	4	5
3000	1	1.3
5000	18	22.5
6000	1	1.3
10000	17	21.3
15000	1	1.3
20000	2	2.5
Total	80	100

Source: Computed by the researcher through primary data collection

The following information was deduced from the Table 4.8 on the size of drinking water tanks. It was found that 22.5 percent of the schools have 1000 liters & 5000 liters size water tanks, followed by 21.3 percent use 10000 liters water tank. 18.8 percent of the schools use 2000 liters of water tank to meet their daily requirements. The tanks with 700, 1500, 2500, 3000, 6000, 15000 and 20000 capacities were used by 15.9 percent schools.

The size of the tanks is important to meet the daily requirement of the school. The water tanks sized with 1000, 2000, 5000 and 10000 are used according to the size of the school strength, higher the number of the students, larger the size of the water tank. Schools with small number of students are having small size of water tanks.

To test the association between number of labour and the size of the tanks the following hypothesis test was run.

$H0_2$: There is no significant correlation between Number of labour and the size of the tanks.

Result:

Table 4.9

Correlations

		Number of labours used to clean the tank	Size of the tanks
Number of labours used to clean the tank	Pearson Correlation	1	-.149
	Sig. (2-tailed)		.188
	N	80	80
Size of the tanks	Pearson Correlation	-.149	1
	Sig. (2-tailed)	.188	
	N	80	80

Source: Computed by the researcher through primary data collection

The number of labours used for cleaning the water tank and the size of labour tanks show negative correlation and there is no significant relationship between the size of tanks and the capacity of the tank. For cleaning of the tanks size is not the deciding factor for the number of labours. The management can decide the number of labours as the ability of the labour is different and can be decided on the basis of labour itself. Here on the basis of negative correlation itself shows no significant relationship between the variables. Thus, Null hypothesis was accepted.

4.3.2 Taps

Taps should be given careful consideration as a part of drinking water infrastructure. Designing and specification of taps needs to be given careful attention to meet local water quality, ease of maintenance and usage by the especially abled (*Divyangjan*). Following are the considerations kept in mind while selecting the taps (Housing for Health, 2021).

- Tap should be mounted for easy accessibility to people with disability.

- Taps are made of brass, plastics, and stainless steel. The taps with plastic and stainless steel are better in case of water with low alkalinity or contains high level of mineral salt.
- Washer is economical and easy to maintain with durability in case of water that contains salt, grit, or other particles. Ceramic disc water taps are easy for small children and people with physical disability (*Divyangjan)* with little maintenance in case of mineral salt above 400 PPM TDS.
- Stainless steel is durable and stay for longer time as compared to brass.
- Type of tap handle like lever, capstan, and mixture taps are comfortable for people with physically challenged and plastic hands are not recommended.
- To maintain flow regulator demands regular maintenance especially when water quality is found to be deteriorated.

In addition to the above, water saving ability is the key factor to be considered for selection of the water taps by the management. Aerators is an innovative technology for saving water specially for sink, washbasin or other publicly used water taps. The designs are made in such a way that saves 80 percent of the water and the rate of flow is between 2 and 8 liters per minute (Water Saving, 2022).

The following section discusses the data analysis of the water taps of the selected schools. For the analysis of different types of water taps used for drinking water in the selected schools, following questions were used to collect data on types of water taps.

Table 4.10

Types of Water Taps Used

Types	Frequency	Percent
A-Semi-Automatic	18	22.5
A And D	3	3.8
B- Automatic	0	0
B And C	2	2.5
C-Push Taps	7	8.8
D-Leaver On-Off	23	28.8
E- On-Off Button	12	15
F- Manual Rotation (Clockwise & Anti-Clock)	15	18.8
Total	80	100

Source: Computed by the researcher through primary data collection

Note

A-Semi-Automatic; B- Automatic; C-Push Taps; D-Leaver On-Off; E- On-Off Button; F- Manual Rotation (Clockwise & Anti-Clock)

Figure-4.2

Types of Water Taps Used

A-Semi-Automatic

B- Automatic

C-Push Taps	 
D-Leaver On-Off	
E- On-Off Button	
F- Manual Rotation (Clockwise & Anti-Clock)	 

Source- IndustryBuying.com, Indiamart.com, Amazon.com, Gem.gov.in

It is evident from the data that 28.8 percent of the school uses Leaver on off type of taps, 22.5 percent of the schools were using Semi- Automatic Push taps whereas 18.8 percent manual rotation taps, 15 percent use leaver type on/off taps, 8.8 percent use Push taps moreover it is found that very few of the selected schools used automatic taps as seen in B & C is only 2.5 percent. 3.8 percent of the schools were found to use A & D type of taps.

Leaver on- off taps and semi-automatic taps were more popular among the tap categories followed by the manual rotation taps. One of the main reasons of using such types of taps is less maintenance and relatively longer life as observed by the school authority.

In case of automatic taps only one school was found using it, the tap is not found to be used for drinking water but for toilet flush systems.

The reason for not using the automatic taps was due to the sophisticated infrastructure. The taps require electricity and become risky for students in case of failure. The sustainability and cost part are also the reason for not using automatic taps. To test the association between number of taps and types of schools the following hypothesis test was run.

$H0_3$: There is no significant difference between number of taps and types of schools.

Result:

Table 4.11

Group Statistics

	Type of School	N	Mean	Std. Deviation	Std. Error Mean
Number of Water taps available for drinking water	Private	38	11.50	10.613	1.722
	Government	42	7.81	6.021	.929

Source: Computed by the researcher through primary data collection

Table 4.12

Independent Samples Test

		t-test for Equality of Means			
		T	Df	Sig. (2-tailed)	Mean Difference
Number of Water taps available for drinking water	Equal variances assumed	1.936	78	.056	3.690
	Equal variances not assumed	1.886	57.303	.064	3.690

Source: Computed by the researcher through primary data collection

From the Table 4.11 and Table 4.12 the number of taps available in the private and government were analyzed, For the result output, analysis shows that P value (.056) is more than significance value. So, the Null hypothesis was accepted. The result shows that there is no significant difference between number of taps and the types of schools. The private and government schools shows that number of taps in government school and private schools are not different**.** The result of the test concludes that the number of taps used in the private and government schools were not different. Thus, it can be concluded that both government and private schools uses monotonous approach and indifferent.

4.3.3 Purifier

Source of water, contamination level and presence of bacteria are important factors on deciding the right water purifier. There are five types of purifiers available in India which are classified as follows:(zelect.in, 2022).

- Reverse Osmosis (RO)
- Ultraviolet (UV)
- Ultrafiltration (UF)
- Activated Carbon

A) Reverse Osmosis (RO)

RO water purifier is the only technology capable of removing the dissolved metals from the water and also protecting from the microbiological contamination. One can be assured about the safe drinking water once RO purifier is installed.

Advantages of RO Water Purifier

- It purifies dissolved solids, metals particles such as arsenic, fluoride and lead which are health hazardous.
- It protects from the waterborne disease from the microorganism like virus, bacteria, germs. It purifies gems dead bodies from the water.
- It improves the taste and odor of the drinking water.
- It’s safe and cost effective and easily maintained.

Disadvantages of RO Water Purifier

- RO is dependent on electricity, no electricity, no functioning of RO.
- It cost electricity as it runs on electricity.
- The wastewater is approximately 5 liters out of 10 liters of RO water.

B) UV Water Purifier

UV technology is chemical free and ecofriendly. It is proven technology to waterborne diseases due microorganism. It has UV lamp tube, during the process water passes through this UV lamp, the gems are killed by the exposure of UV light. This type of technology is suitable for the less TDS (total dissolved solid) like river water.

Advantages of UV water purifier

- The cost of maintenance is low due the one time change of Lamp only when the light stopes working.
- It has high purification rate in a minute it purifies 2-4 liters of water.
- Use of bulb makes it cheaper which requires less electricity.
- It requires less cleaning. With storage it requires cleaning twice a month whereas without storage doesn’t needs no manual cleaning.

Disadvantages of UV water purifier

- It doesn’t improve the taste of water.
- It ensures the essential minerals of the drinking water.
- It doesn’t purifier the water from the dead bodies in the water.
- Doesn’t ensure the safe drinking water.
- The taste and odor of the drinking water tanks is not improved by this type of filter.
- It doesn’t purify hard water.
- It doesn’t remove the chemicals from the water.

C) UF (Ultra Filtration) Water Purifier

This type of filter has membrane of hollow fiber, made from the thin layer of material which is capable to separate dust particles in the water. UF technology is similar to RO, yet the main difference is- RO blocks every particle and UF blocks only larger one. Following are some of its advantages and disadvantages:

Advantages of UF

- It works without consumption of electricity.
- It is suitable for any type of water pressure.
- It is free from chemicals.

- Compared to UV filters it can purify muddy water.
- It separates the germs dead bodies and bacteria are blocked.
- The life is long due to the easy cleaning of the membrane.

Disadvantages of UF

- It has limitation with hard water, dissolved solids can’t be purified by it.
- Frequent cleaning is required

D) Activated Carbon Water Purifier

This type of filter is made from the carbon of coal, coconut, nut shells and wood, that separates it in two parts. It removes most of the waterborne disease. It is most effective in removing chlorine from the water.

Advantages of activated carbon filter

- It removes chlorine from the water and saves from the disease.
- Free from heavy metals.
- Improves the taste and odor of the water.
- It improves the life of the RO membrane by blocking the chlorine and other particles.

Disadvantages of carbon activated filter

- It is not useful in treating hard water.
- It does not free from virus and bacteria and cause microbiological disease.

The selection of the purifier is important and needs serious attention. Looking at the above advantages and disadvantages the RO purifier stands safe and ensures better safety compared to all. In the following section details on schools using different types of water purifier is analyzed from the data collected from the selected schools.

Table 4.13

The Type of Water Purifier System Is Used by The Institute

Types	Frequency	Percent
RO Water Purifier System	50	62.5
Water Cooler	2	2.5
Water Cooler with RO System	11	13.7
Non	16	20
Others	1	1.3
Total	80	100

Source: Computed by the researcher through primary data collection

Figure-4.3

The Type of Water Purifier System Is Used By The Institute

RO Water Purifier System	
Water Cooler	
Water Cooler with RO System	
Others	

Source- IndustryBuying.com, Indiamart.com, Amazon.com, Gem.gov.in

The Table 4.13 shows the schools using types of RO water purifier system. It was found that 62.5 percent of the schools are using RO water purifier system and 13.7 percent are using water cooler with RO system while 20 percent of the selected schools were not using water purifier system at all. Only 2.5percent of the selected schools were dependent only on water coolers.

The data reveals that among the 77.5 percent (62.5+ 13.7+1.3) of schools were concerned about the purification of the water. 22.5 (20+2.5) percent of the schools relied on the VMC water supply and considered it safe for drinking, therefore, did not use RO purifier.

Table 4.14

Number of Water Purifier In Use

No.	Frequency	Percent
0	19	23.7
1	44	53.7
2	6	7.5
3	6	7.5
4	1	1.3
5	2	2.5
7	1	1.3
10	2	2.5
Total	80	100

Source: Computed by the researcher through primary data collection

The Table 4.14 illustrates the percentage of number of water purifiers used in the selected schools of Vadodara city. It was evident that 53.7 percent of the schools use 1 units of RO purifier, 7.5 percent of the selected schools use 2 purifiers and 3 purifiers, and 2.5 percent of schools installed 5, and 10 units of water purifier followed by 1.3 percent, relatively very low percentage of the selected schools use 4 purifiers and 7 RO purifiers.

The 53.7 percent of the schools meet the RO water requirement with single unit of the RO machine. According to the school authority the single unit is enough to meet their daily water requirements. Only 15 percent of the schools were found with 2 and 3 units of RO found with 15 percent only. The large schools were observed having installed higher number of RO units. Schools without RO systems were found to be 22.5 percent as they relied on VMC water while 1.3 percent schools were found to be using purifiers other than RO. To test the association between number of purifiers and types of schools the following hypothesis test was run.

H0$_4$: There is no significant difference between the number of purifiers and the types of schools.

Table 4.15

Group Statistics

	Type of School	N	Mean	Std. Deviation	Std. Error Mean
Number of purifier system	Private	38	1.97	2.444	.396
	Government	42	1.00	.826	.128

Source: Computed by the researcher through primary data collection

Table 4.16

Independent Samples Test

		t-test for Equality of Means			
		T	Df	Sig. (2-tailed)	Mean Difference
Number of purifier system	Equal variances assumed	2.434	78	.017	.974
	Equal variances not assumed	2.338	44.621	.024	.974

Source: Computed by the researcher through primary data collection

Table 4.16 shows the data analysis of the Number of purifier system and the type of schools are tested. For the result output, analysis shows that P value (.017) is less than significance value. So, the Null hypothesis was rejected. It shows that there is significant difference between number of water purifier system used in the private schools and government school. Private school use a greater number of water purifier in the schools in comparison to government school.

4.3.4 Water Cooler

Investing in water cooler in the schools for students and teachers encourages them to drinking more water during the school hours, keeping the body hydrated maintaining good health. Thus, investing in coolers can be great investment rather than expense. The following are the advantages of cooler discussed in the following section (Darwin, 2017)

Advantages

- Beat the scorching heat.
- Keep body hydrated as it encourages students and teachers to drink more water.
- Prevent sickness by keeping adequate level of water consumption as it encourages to drink more water than normal water.
- Helps in increasing the productivity of the students and teacher.
- Easy to install.
- Requires less space.
- Requires less maintenance.
- Maintains the temperature of the water.

Disadvantages

- Regular cleaning and monitoring of the storage tank required.
- Cost of electricity.
- Nonfunctional in the absence of electricity.
- Water coolers are costly.

The information on advantages and disadvantages of the cooler helps in taking the decision on installing the coolers in schools by the management. The cooler can be investment expenditure on the health of the students and teachers, which advocates of installing in the schools over its disadvantages.

The following section details the analysis of the data collected from the schools on water coolers for providing drinking water.

Table 4.17

School Using Water Cooler Attach to RO System

Types	Frequency	Percent
50 liters	30	37.5
100 liters	7	8.8
150 liters	4	5
200 liters	3	3.8
N/A	36	45
Total	80	100

Source: Computed by the researcher through primary data collection

The Table 4.17 shows the school using water cooler attached to RO system. Data shows that 55 percent of the selected schools use water cooler for providing drinking water to their students with different capacities, showing 37.5 percent having 50 liters capacity followed by 100 liters capacity with 8.8 percent and only 5percent showing 150 liters capacity storage. Water cooler with high capacity i.e., 200 liters are observed only 3.8 percent of the selected schools. 45 percent of the selected schools has no water cooler.

The analysis shows that there was total 22.1 (17) percent, calculated as 17=36 (N/A water cooler with RO) from Table 4.17 -(minus) 16 (Non)- (minus) 2 (only cooler)-1(others) (see Table 4.13) schools not using water coolers for water infrastructure but RO as important for school infrastructure whereas 46.8 percent (36) of the schools don’t use RO and water cooler together as their drinking water infrastructure. To test the association between the cooler attached RO systems used in private and government schools the following hypothesis test was run.

$H0_5$: Cooler attached RO system and type of schools are not independent**.**

Result:

Table 4.18

Cooler attached RO system and Type of School Crosstabulation

			Type of School		Total
			Private	Government	
Cooler attached RO system	No	Count	5	14	19
		% Within Type of School	13.2%	33.3%	23.8%
	Yes	Count	33	28	61
		% Within Type of School	86.8%	66.7%	76.3%
Total		Count	38	42	80
		% Within Type of School	100.0%	100.0%	100.0%

Source: Computed by the researcher through primary data collection

Table 4.19

Chi-Square

	Value	Df	Assumed Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.484[a]	1	.034		
Continuity Correction	3.439	1	.064		
Likelihood Ratio	4.649	1	.031		
Fisher's Exact Test				.039	.031
Linear-by-Linear Association	4.428	1	.035		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 9.03.

Source: Computed by the researcher through primary data collection

The analysis of the cooler attached RO system and the types of schools are tested. For the result output, analysis shows that P value (.039) is less than significance value. So, the Null hypothesis was rejected. It shows that cooler attached RO systems are dependent on types of schools, private schools are using more cooler attached RO system than government

4.3.5 Hand Pump (other source of daily water requirement)

As much as 42.9 percent of households in rural areas use hand pumps as the principal source of drinking water and 40.9 percent of households in the urban areas use piped water as the principal source. Hand pump is the primary source of drinking water in rural households but that is not the case with the cities. Handpumps play very important role in rural India but, not in urban India as the data shows. Water pumps are economical and sustainable. It has very less maintenance cost. On the other hand, it has serious disadvantages due to contamination of water and not easy for school kids to operate (Neetu, 2019).

The hand pumps are recently losing its importance in drinking water due to high cases of contamination found (Shamrukhz, et al.,2000; Chauhan, et al.,2016; Soni, et al. 2018) and also the purpose of hand pumps is shifting from drinking water to sanitation purpose due to greater sustainability. (Tribune India, 2015) Installation of hand pump is a costly affair subject to the ground water reservoir.

During the data collection hand pump is also seen as important factor for drinking water source. The data collected on the handpumps in the selected schools for meeting their daily requirement as sources other than VMC water supply sources is collected.

Table 4.20

The Other Source of Water

Types	Frequency	Percent
Ground Water	19	23.8
Lake Water	1	1.3
Well Water	2	2.5
Hand Pump	1	1.3
Other Surface Water	57	71.3
Total	80	100

Source: Computed by the researcher through primary data collection

The Table 4.20 highlights the various sources of the daily water requirement by the schools. It was found that hand pumps are also used for daily requirement of the drinking water supply, but they contribute only 1.3 percent and the major source of other than VMC tap supply is 71.3 percent comes from others (Water Tankers). Handpumps are not forming significant part of water infrastructure in the city within the VMC.

The data analyses that schools are also dependent on the other source of water supply for meeting their daily requirement for water other than drinking water in the schools. Thus, the schools are not completely dependent on the VMC for their daily water requirement.

4.3.6 Water Motor

For the supply of drinking water from ground source to water tank or one storage to other storage, data on water motor revealed that all the schools are using water motor for ensuring water availability for drinking and other use.

Water motors are useful in meeting the daily requirement of the schools from the ground water or the stored VMC water to elevated water tanks.

4.4 VARIABLE FACTORS

The factors that change with changes in and are known as variable factors. The variable factors of the drinking water infrastructure are discussed in detail.

4.4.1 Labour

Prof. Marshall defines, any exertion of mind or body undergone partly or wholly with a view to earning some good other than the pleasure derived directly from the work.

Labour is classified into four classes i.e., Professional, Skilled, Unskilled & Semi-skilled. Labour is also classified in two categories on the basis of mental and physical ability. The research study analyses the labour and its role in keeping drinking water infrastructure updated. Labour is needed mainly for the purpose of cleaning and keeping water infrastructure updated, like repair of taps or leakages, plumbing work etc. The analysis of labour required to clean the drinking water tank is discussed in the Table 4.21 & Table 4.22

Table 4.21

Cleaning of Drinking Water Tank

Time	Frequency	Percent
Once In A Week	2	2.5
4 Days A Week	1	1.3
Once A Two Month	7	8.8
Once A Three Month	17	21.3
Once A Year	6	7.5
Half-yearly	47	58.8
Total	80	100

Source: Computed by the researcher through primary data collection

It is found that 58.8 percent of the selected schools used half-yearly cleaning, once a three-month cleaning is done by 21.3 percent of the selected schools, 7.5 percent schools clean water tank yearly, 8.8 percent of the selected schools cleans water tanks once in two months and 2.5 percent of the selected schools use once a week cleaning of the water tank. Only 1.3 percent of the selected schools clean 4 times a week.

It has been observed from the data that schools opting a general practice of cleaning the water tanks once, twice or three times in a year collectively come to 87.6 percent, and 12.4 percent percentage of the schools clean the tanks very regularly. It was revealed during the survey that the schools with RO clean tank only once a year.

Table 4.22

Number of Labour Used to Clean the Tank

	No.	Minimum	Maximum	Mean	Std. Deviation
Labours are used to clean the tank	80	1	12	3.89	2.490

Source: Computed by the researcher through primary data collection

The data in Table 4.22 on number of labours used to clean show the average of 3.89 labours to clean the water tank and the majority of the schools uses 4 Labours to clean water tank.

The opinion of the principals was recorded to know whether larger size of tank requires large no. of labour, and the small tanks requires less labour. They replied that the usual practice of cleaning the tanks doesn't depend on the size of the tanks. Usually, 2-4 labour is enough to clean the any size of the water tanks in the schools. Its only the matter of time consumed to clean the tank. if 2 labours are used to clean the 10000 liters of tank, it will take 4 to 5 hours to clean and 2 to 3 hours in case of 4 labours. To know the association between the cleanliness between government and private schools

H0₆: Cleaning of water tanks and types of schools are not Independent.

Result:

Table 4.23

Cleaning of Water Tanks and Type of School Crosstabulation

Cleaning of water tanks		Type of School		Total
		Private	Government	
Once In A Week	Count	2	0	2
	% Within Type of School	5.3%	0.0%	2.5%
4 Days A Week	Count	0	1	1
	% Within Type of School	0.0%	2.4%	1.3%
One A Two Month	Count	2	5	7
	% Within Type of School	5.3%	11.9%	8.8%
Once A Three Month	Count	3	14	17
	% Within Type of School	7.9%	33.3%	21.3%
Once A Year	Count	4	2	6
	% Within Type of School	10.5%	4.8%	7.5%
Half-yearly	Count	27	20	47
	% Within Type of School	71.1%	47.6%	58.8%
Total	Count	38	42	80
	% Within Type of School	100.0%	100.0%	100.0%

Source: Computed by the researcher through primary data collection

Table 4.24

Cleaning of Water Tanks and Type of School Crosstabulation

Chi-Square Tests			
	Value	Df	Assumed Sig. (2-sided)
Pearson Chi-Square	12.945[a]	5	.024
Likelihood Ratio	14.736	5	.012
N of Valid Cases	80		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .48.

Source: Computed by the researcher through primary data collection

The test for cleaning of water in the private and government schools are tested statistically. It was found from the Table 4.24 that the P value i.e., .024 was less than .05. The Null hypothesis was rejected, and alternate hypothesis is accepted that cleaning of water tank is dependent on the type of schools. The private schools are cleaning water tank more frequently than the government schools.

H0$_7$: There is no significant association between number of labours used for cleaning and the type of school.

Result:

Table 4.25

Group Statistics

	Type of School	N	Mean	Std. Deviation	Std. Error Mean
Number of labours to clean the tank	Private	38	4.76	3.044	.494
	Government	42	3.10	1.495	.231

Source: Computed by the researcher through primary data collection

Table 4.26

Independent Samples Test

		t-test for Equality of Means			
		T	Df	Sig. (2-tailed)	Mean Difference
Number of labours to clean the tank	Equal variances assumed	3.156	78	.002	1.668
	Equal variances not assumed	3.060	52.645	.003	1.668

Source: Computed by the researcher through primary data collection

The number of labours used to clean the tank and the type of schools was tested statistically in Table 4.26. It was found that the P value i.e., .002 is less than level of significance. Thus, we reject the null hypothesis and accept the alternate hypothesis. It shows that number of labours used clean water tanks in private is more than government schools.

4.4.2 Purifier Filter

Purifier filter is the important part of RO system which ensures the quality output. To ensure the quality output there must be a regular replacement of the filter. The RO System once installed needs more attention for replacing its filter on time otherwise it will not the serve the objective and purpose of the RO system due to which filter cost occur at regular intervals.

The filters are the variable factors which change with in the year many times depending upon the usage of the RO. Filters are changed monthly or quarterly or half yearly depending on its usage.

The data collected on the filters are collected from the capacity of the RO storage. The analysis of the storage capacity of RO is discussed in the Table 4.27.

Table 4.27

The Storage Capacity of RO

Capacity	Frequency	Percent
50 LPH	42	52.5
100 LPH	7	8.8
150 LPH	1	1.3
200 LPH	4	5
250 LPH	5	6.3
N/A	21	26.3
Total	80	100

Source: Computed by the researcher through primary data collection

Schools with small RO capacity filters with capacity of 50 liters per hour and 100 liters per hour were found to be 61.3 percent altogether while 12.6 percent used large capacity storage filters.

Small LPH purifiers are compatible with size of the coolers which makes 50 LPH and 100 LPH more popular than the large size of purifiers.

For the analysis of filters used by the RO purifiers the capacity of RO filters is important. The filters and membrane fillers are regularly changed at specific intervals to keep the RO systems updated. The schools replace their RO filters every 2 months was reported during the survey. The response on the replacement of filters varied from school to school. The reason so for the usage of the filters varied. But usually, the management used to replace the filters every 2 or 3 months regularly.

4.4.3 Electricity

Water infrastructure without electricity is non-functional and causes hardships if it remains absent for a longer period of time. The drinking water infrastructure is dependent on electricity because RO and water coolers are electricity operated systems. Electricity is also used for filling elevated tanks or ground water extraction for daily use. The Table 4.28 shows analysis of the average number of hours electricity is used to fill drinking water tank (per day).

Table 4.28

The Average Number of Hours of Electricity Is Used to Fill Drinking Water Tank (Per Day)

Descriptive Statistics					
	N	Min (minutes)	Max (minutes)	Mean	Std. Deviation
The average number of hours electricity is used to fill drinking water tank (per day)	80	0	120	37.81	17.697

Source: Computed by the researcher through primary data collection

The data on electricity used for filling the drinking water tank shows average time of 37.81 minutes with 17.697 standard deviation.

During the survey it was observed that time used (electricity consumed) to fill the water tank excluding the electricity used for RO and Water cooler was around 30 minutes which again depended on the HP (Horsepower). The electricity used for storing the drinking water tank is important part of the infrastructure but may not be given so much of importance as it is very difficult to separate from the total electricity consumed for other activities and it is a very small portion in the entire usage of electricity.

4.4.4 Bleaching powder (cleaning purpose)

It is found that majority of the schools uses bleaching powder to clean the water tanks, it is also found that no standard cleaning material is used for cleaning the water tank. Further, was also identified that water tank is cleaned with normal water, detergents, bleaching powder as the major cleaning materials.

The following part summarizes the findings from the drinking water analysis to address the Primary objective-1, stated at the beginning of the analysis: Secondary objective-1, 2 and 3 from the respective findings

Findings

The research found that the drinking water infrastructure in the selected study of school are identified and classified as Fixed and variable factors. Each factors gives the following findings.

Water Tanks

From the Table numbers Table 4.7 and Table 4.8 it was found:

- Schools are found with traditional water storage tanks using concrete and plastic tank. the reason for using concrete tank is due its durable nature and plastic tanks are cost effective with ready installation.
- Majority if the schools used 1000, 2000, 5000, 10000, liters capacity tanks to meet their daily requirement.
- The majority of the schools use RCC water tanks over plastic

Taps

From the Table numbers Table 4.10 it was found

- It was found the lever on -ff taps are more chosen over other types of tapes due to its sustainable nature, on the other hand semi- automatic push taps are also trending in schools due to the water saving nature of the taps but not ensure the sustainability.

Purifier

From the Table numbers Table 4.13 and Table 4.14 it was found

- High risk of water contamination and health hazard increased the use of water purifier not only in household but also outside the households. Schools are taking precautions to provide clean and safe water to its students, around 23 percent of the schools found without water purifier system in their existing water infrastructure.

Water cooler

From the Table 4.17 it was found

- To improve the drinking water infrastructure water coolers are playing important roles. It was found that 55 percent school with RO purifier have installed water coolers along with it, which makes it important part of drinking water infrastructure.

Under variable factors of drinking water infrastructure

Labour

From the Table 4.21 and Table 4.22 it was found

- The size of the water tank and labour used to clean it are not dependent. So, the labour used to clean can be standardized.
- Labour is required half yearly to clean water tank.
- Average number of the labour required was only 4 every six months.

Purifier Filter

It was found in the conclusion of 4.4.2 that majority of the RO system replace their filters on quarterly basis, but monthly replacement was required.

Electricity

- Electricity was not given much importance while talking about drinking water infrastructure. But it is known fact that in the absence of electricity, entire drinking water infrastructure is inactive as there is no alternative to electricity. The finding from the section 4.4.3 that only 35 minutes on an average was the consumption electricity for running motor. The RO system and Water cooler has significant usage of electricity.

Bleaching powder (cleaning purpose)

- From the conclusion of the 4.4.4 it was found that there was no standard cleaning material found for cleaning water tanks. The frequency of cleaning the tank was found average half yearly which can be the one of the reasons for considering bleaching powder so important part of drinking water infrastructure. The only known source for cleaning was found was “Bleaching powder” as cleaning agent for water tanks.

The secondary objective 1: to identify the dependence of educational institute on municipal supply or private supply of drinking water

Findings

- For Drinking water 22.5 percent of the schools depends on the VMC water supply (from the Table 4.13 and Table 4.14).
- From the descriptive analysis of the Table 4.20 showing the data on the other source of daily water requirement reveals that 23.8 percent and 71.3 percent of the schools are not completely dependent on VMC for Daily requirement of water supply; Collectively 94.1 percent of the schools are partially dependent on Ground water and water Takers.

The secondary objective 2: to identify the educational institution lacking drinking water infrastructure factors.

Findings

- The descriptive analysis of Table 4.13, Table 4.14 and the feedbacks of the principals are obtained on their minimum requirement towards the demand for drinking water. The empirical study found that schools are lacking with RO water purifier in the schools, water cooler.

The secondary objective 3: To compare the drinking water infrastructure at selected public owned and private owned educational buildings.

Result:

- Results of the Hypotheses $H0_1$, $H0_2$, $H0_3$, $H0_4$, $H0_5$, and $H0_6$ shows that Drinking water infrastructure of Private schools is found to be surpassing that of the Government schools.

The primary objective 2: To identify the drinking water infrastructure operational & maintenance of cost.

4.5 DATA ANALYSIS OF FIXED COST AND VARIABLE COST

Source on cost collected from the respondents is based on the minimum and maximum cost to cover the wide range of variety and quality of the material.

For the purpose of collecting data related to rates of fixed and variable factors, field studies are conducted within the Vadodara city from the dealers, rate contractors and merchants regarding their opinion on prices. One observation made during the field and focused group study is that these players and suppliers source materials from different avenues which makes price variation in terms of fluctuations subject to availability, specification, quantity and quality. To solicit the data, online resources are also referred from the Government and private websites, including www.Gem.gov.in, www.indiamart.com, www.industrialbuying.com, www.amazon.com & www.flipkart.com.

The response of the school authority has suggested the minimum and maximum costing of the variables. Important feedbacks were noted while obtaining the minimum price and maximum price. Some of respondent gave the minimum expected cost but no response on the maximum cost, some of the respondents showed the bills of expenditure from their records to share the information, some of the schools denied responding on maximum and minimum cost. Some of the schools revealed that they don't have information on the variables specially for RCC water tanks.

The researcher faced many challenges while collecting the response regarding the actual cost of the drinking water infrastructure variables.

- At many instances, the management was not aware of the cost.
- The cost incurred at the time of the construction was different compared to the present price.
- The respondent was able to give only the range of cost between maximum and minimum based on their administrative experience.
- The Management also disclosed that below minimum cost products are also available. When asked why they choose a medium cost product? The response was that these medium cost products will work well with minimum expected duration.

- The minimum expected period was not defined by the respondent.
- It was difficult to separate cost of certain variables.
- Some of the costs were obtained from the local labour market.

The entire complexity on obtaining cost of the variables was classified on the basis of the description of the respondent. The cost of the variable was classified into maximum and minimum ranges for the variables.

The cost estimates are based on following assumptions:

- The prices of the minimum range of the factors ensure the standard quality.
- The price is low for large quantity and high for small quantity.
- The product price range out-side the minimum and maximum are not sustainable in terms of quality and cost respectively.
- The price is considered as current market price.
- The prices are representative of respective variables (factors of drinking water infrastructure).

The detailed analysis of the cost of drinking water infrastructure is discussed in the following section.

After the identification of the fixed factors i.e., Drinking water Tank, Taps, Purifier, Water cooler, Hand Pump, Water Motor and Variable Factors i.e., labour, Purifier Filter, Electricity, bleaching powder (cleaning purpose) the cost estimate is obtained from the selected published sources, experts, contractors, and retail stores are consulted for getting the market price of the materials. Minimum and maximum cost price range are considered for wider coverage.

4.5.1 Drinking water tanks Cost

The water tanks are classified into two types based on the Table 4.5, Type-I is the concrete tank, and the Type-II is the plastic tank.

Table 4.29

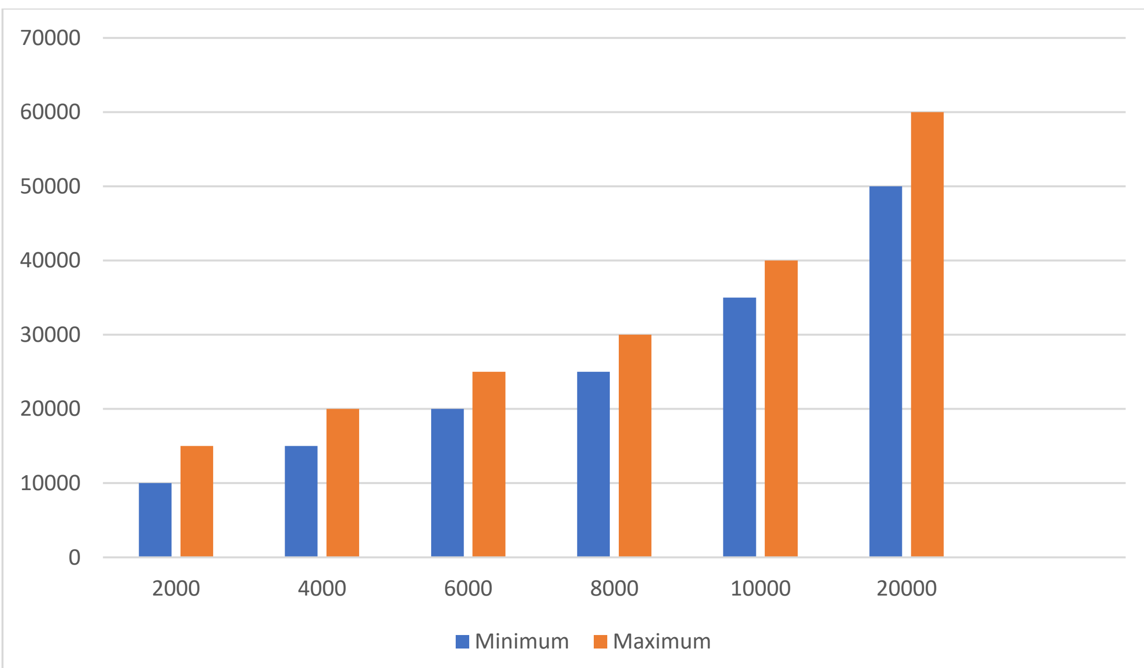
Cost of RCC Water Tanks (Type-I)

CATEGORY (liters)	Cost (Minimum) in ₹	Cost (Maximum) in ₹
2000	10000	15000
4000	15000	20000
6000	20000	25000
8000	25000	30000
10000	35000	40000
20000	50000	60000

Source: Computed by the researcher through primary data collection

Figure-4.4

Cost of RCC Water Tanks (Type-I)



The bar chart 4 and Table 4.29 gives the picture of the cost of construction of the RCC tank showing the minimum cost and maximum cost.

The cost of RCC tanks is classified as Type- I tank which cost from ₹10000 to ₹15000 for the constructing 2000 liters, and for 4000 liters its ₹15000 to ₹20000. The cost of 6000 liters and 8000 liters tank costs from ₹20000 to ₹25000. and ₹25000 to ₹30000 respectively. Tank of 10000 liter cost from ₹35000 to ₹40000 and the largest 20000 liters tank cost ₹50000 to ₹60000. The data shows that every 2000 liters the range increases by ₹5000.

The cost data on the actual existing water tanks of the schools was not available because the cost of the existing school tanks was not known from the school authority as it was not possible to separate the cost of water tanks from the total cost of the construction. Also, the cost doesn't reflect the current market price of the tanks and doesn't reflect the representative price of the water tank.

The water tank is important factor for drinking water infrastructure and forming the fixed cost, in drinking water infrastructure.

Table 4.30

Cost of Buying Plastic Layered Tank (Type-II)

Capacity of the Tank	₹6/litre Minimum Price	₹26/litre Maximum
2000	12000	52000
4000	24000	96000
6000	36000	156000
8000	48000	208000
10000	60000	260000
20000	120000	520000

Source: Computed by the researcher through primary data collection.

Figure-4.5

Cost of Buying Plastic Layered Tank (Type-II)

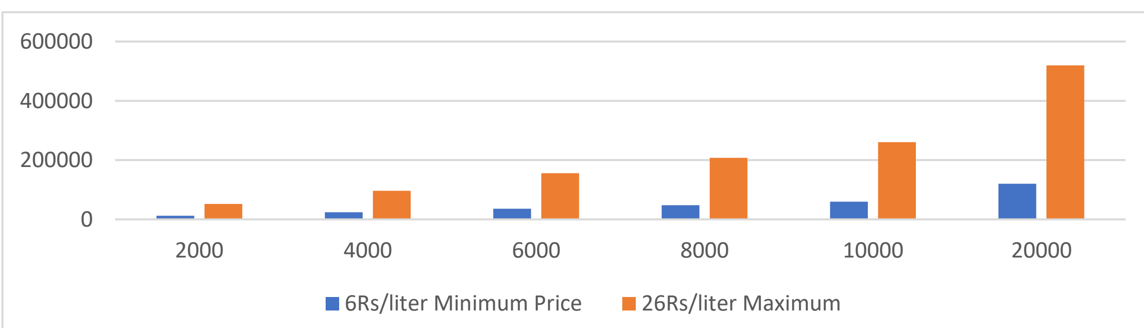


Table 4.30 shows the cost of plastic water tank with minimum and maximum cost. The cost of plastic tank is calculated on the basis of minimum price of ₹6 per liter and maximum price ₹26 per liter. The cost Table and bar diagram in figure 4.5 and Table 4.30 show that the cost increases proportionally, and the cost price depends on every liter of the size of the tank.

It can be deduced that; schools may choose to have only concrete water tank or plastic tanks or combination of both. The cost can be calculated according to the requirement of water tank. This can be explained with an example:

Example 1

The school requiring 2000 liters water tank for the daily requirement prefer to have concrete tank. Using Table 4.15 the cost of construction would be ₹10000 to ₹15000.

Example 2

The school requiring 2000 liters water tank for the daily requirement prefer to have plastic tank. The cost of construction of the plastic tank would range from ₹12000 to ₹52000.

Example 3

The school requiring 4000 liters water tank for the daily requirement prefer to have concrete and plastic tank. The cost for concrete tank for 2000 liters would cost ₹10000 to ₹150000 and plastic tank would cost ₹12000 to ₹52000.

Thus, it can be concluded that given the cost constraint, the schools can choose the water tank accordingly. Usually, plastic tanks are used to increase the capacity of the total water requirement for the school or to meet the emergency needs.

To compare the cost of both the tanks the Table 4.31 gives the information on minimum and maximum cost of plastic and RCC tanks.

Table 4.31

Comparison between Plastic and RCC (Concrete Tank)

Capacity of the Tank	Cost (Minimum)	₹6/litre Minimum Price	Cost (Maximum)	₹26/litre Maximum
2000	10000	12000	15000	52000
4000	15000	24000	20000	96000
6000	20000	36000	25000	156000
8000	25000	48000	30000	208000
10000	35000	60000	40000	260000
20000	50000	120000	60000	520000

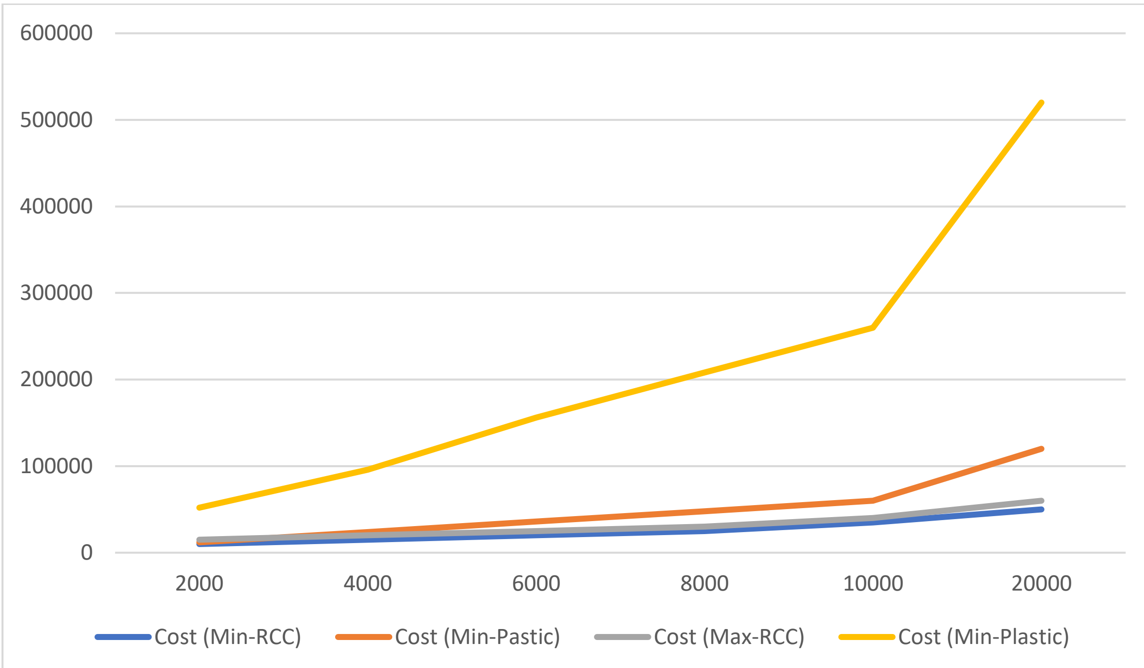
Source: Computed by the researcher through primary data collection

Based on the figure 4.6 The line graph illustrates the cost comparison between plastic and RCC tank. The cost of installing the plastic tanks, considering minimum cost, is costlier than installing

RCC water tanks not only in case of minimum cost consideration; But maximum cost of RCC tanks is lower than the minimum cost of plastic tanks.

Figure-4.6

Comparison between Plastic and RCC (Concrete Tank)



It was observed from figure 4.6 that the plastic tanks are costlier than RCC tanks. The plastic tanks used by the schools chosen over RCC tanks in case of additional requirement of the water storage. This was due to the two reasons; The cost of the small size plastic tanks relatively costly but found affordable to the budget; The RCC tanks require more time cost and space for installation.

Therefore, despite the high cost of the plastic tanks over the RCC tanks, small plastic tanks are installed and preferred to increase the capacity of the tanks.

4.5.2 Taps Cost

Cost of tap are based on the classification made on the basis of types of taps used in the selected schools.

Table 4.32

Tap Cost

Type	Cost (min) in ₹	Cost (max) in ₹
Semi- Automatic	1500	3000
Push / pull	250	700
Leaver On-Off	150	1500
Manual Rotation	100	300
Automatic	2200	6000

Source: Computed by the researcher through primary data collection

Figure-4.7

Tap Cost

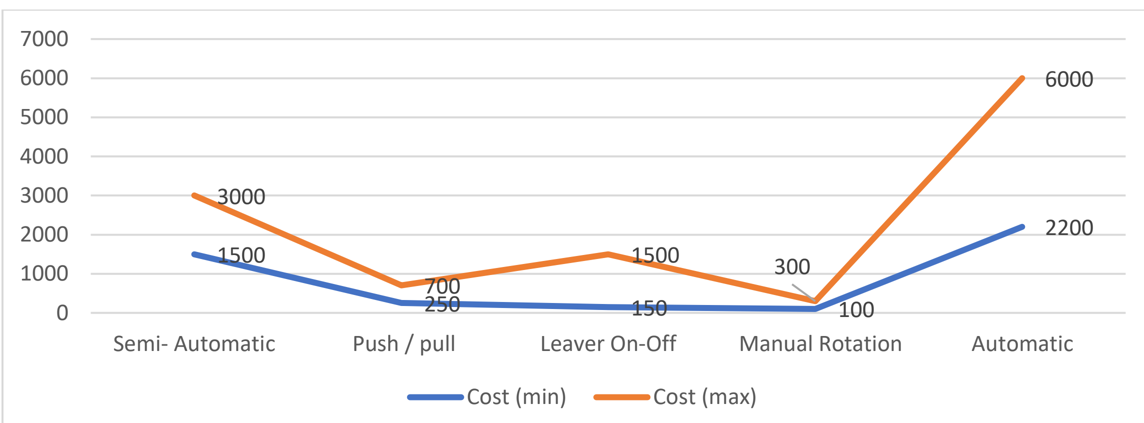


Table 4.32 shows the cost on different types of taps with minimum and maximum cost. The line graph gives the picture of comparison between the types of taps and their cost. The cost of semi-automatic tap is moderate and ranges from ₹1500 to ₹3000 which indicate the bottom and top standard taps, Push / Pull taps ranges from ₹250 to ₹700 which include plastic and metal taps, leaver on- off taps are costing range from ₹150-₹1500 with wide variety and range, manual rotation taps are the cheapest among the taps which ranges ₹100 to ₹300, and the automatic taps are the costliest among all which ranges between ₹2200 and ₹6000. Automatic taps are not found to be

used in the selected schools because of risk, electricity cost, sophisticated infrastructure, durability, and sustainability aspects.

The 70.1 percent (28.8 + 22.5 + 18.8) of selected schools found were using leaver on/ off, semi-automatic and manual taps due to the lower cost. The cost of push/ pull shows relatively cheaper than semi-automatic taps but are not chosen by the majority of the schools because of the durability and sustainability reason. During the survey, in the informal discussion with the respondent, reason was asked for not using this kind of taps even though they are low in cost and water saving, the respondent gave reason that push/ pull taps work only for one or two weeks due to frequency of its usage they get easily damage and it cause lots of water wastage.

Thus, the taps are important part of drinking water infrastructure and cost of taps are considered as maintenance cost of the drinking water infrastructure.

5.3 Purifier Cost

Water purifiers considering RO technology are considered superior to other types of Purifiers as the data from the selected schools found with RO purifier among the types of purifiers discussed. The school under the study uses 50 LPH and 100 LPH considered to be sufficient as the more numbers of the RO are used to meet the daily requirement. The Table 4.33 shows cost of purifier as follows:

Table 4.33

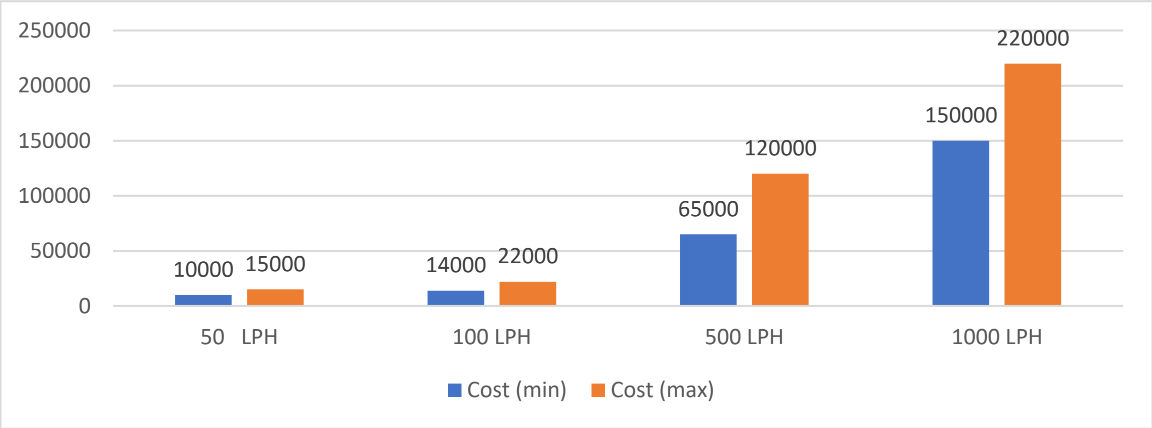
Purifier Cost

Type	Cost (min) in ₹	Cost (max) in ₹
50 LPH	10000	15000
100 LPH	14000	22000
500 LPH	65000	120000
1000 LPH	150000	220000

Source: Computed by the researcher through primary data collection

Figure-4.8

Purifier Cost



The Table 4.33 and figure 4.8 gives the maximum and minimum cost on the purifier. The size of the RO is selected on the basis of the students enrolled in the schools, the selected schools are using type 50 LPH and 100 LPH RO purifier technology which cost between ₹10000 to ₹22000 without including the cost of filter refills. The 50 and 100 LPH are more preferred than other types as its cost effective and the capacity is adequate. During the survey the researcher tried to investigate the reason for not using RO plant in case of the large strength of the schools. It was known in the informal discussion with principals of the schools that RO plants need extra place, time, cost, monitoring and certain permissions and certification from the government, it is more preferable to have three RO system of 100 capacity over one RO plant; it will help in increasing access point at different floors and reduce the rush over a single place. It was also revealed that small RO plants don't create rush at the time of lunch where all need water after lunch, the management revealed that maximum students come with their water bottle, and they fill water bottle from RO system which helps in maintaining the easy access and doesn't create rush at the drinking water place.

RO system is very important part of drinking water infrastructure that ensures the safety and security of drinking water. Thus, cost on RO purifier system forms fixed cost of drinking water infrastructure.

4.5.4 Water cooler Cost

Water cooler is used as storage of the RO filtered water and used for cooling the drinking water. The cost of the coolers varies according to the capacity of the water storage. Regularly 50 liters and 100 liters were used which would cost between ₹15000 to ₹29000. The 150 liters and 200 liters are costing between ₹50000 and ₹70000.

Table 4.34

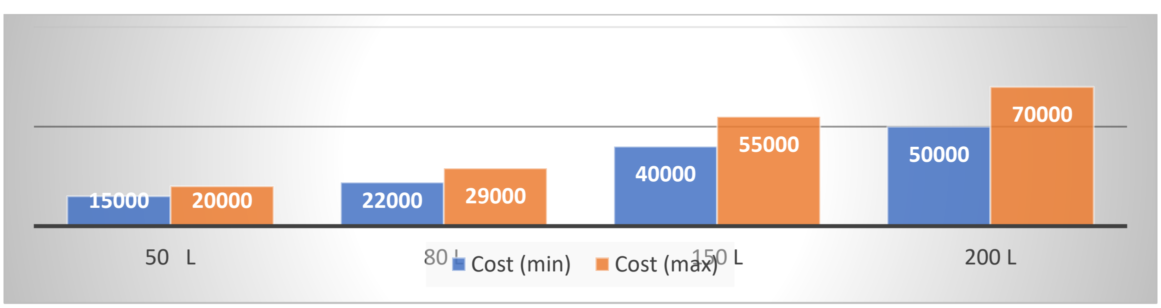
Cost of Cooler

Type	Cost (min) in ₹	Cost (max) in ₹
50 L	15000	20000
80 L	22000	29000
150 L	40000	55000
200 L	50000	70000

Source: Computed by the researcher through primary data collection

Figure-4.9

Cost of Cooler



The Table 4.34 and bar chart 4.9 show that the cost of the water cooler is obviously low for 50 and 100 liters of capacity than large. Most of the schools have opted for small capacity of coolers for its cost, can be the strong reason other than the capacity of the RO system.

Water cooler are also a long-term expenditure for drinking water infrastructure which is Fixed cost in nature.

4.5.5 Hand Pump Cost

The calculation of the hand pump cost is obtained from the published sources and experts opinion. The cost of hand pump set ranges between ₹5000 to ₹10000. The main cost of installing makes the handpump more costly. The installation cost varies from ₹80 to ₹120 per feet of digging (Jagdish, 2018). Which can take the cost to ₹25000 for 200 feet depth handpump. The handpump is not considered a safe drinking water infrastructure evident from the review of literature (Shamrukhz, et al.,2000; Chauhan, et al.,2016; Soni, et al. 2018; Tribune India, 2015). It was also found during the survey only one school had this facility.

The Hand pumps are not considered important part of the schools drinking water infrastructure in the urban areas of Vadodara. The reason can be the contaminated water.

4.5.6 Water Motor Cost

The cost of water motor used in the schools is classified on the basis of HP and its capacity of water storage per hour.

Table 4.35

Cost of Motor

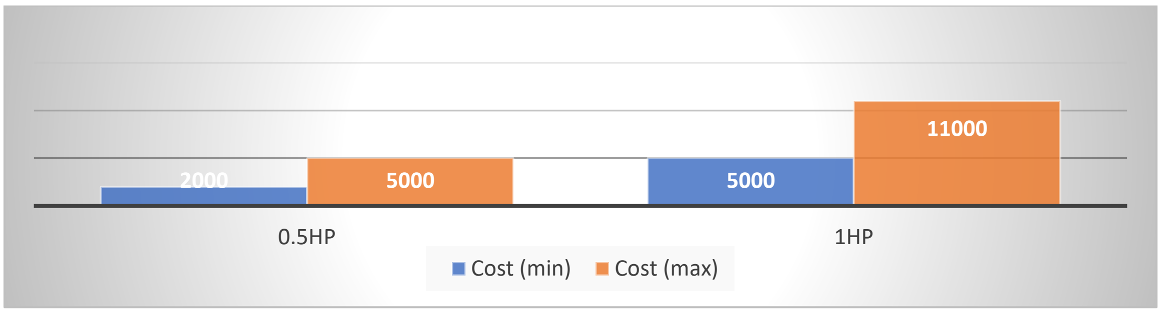
Type	Cost (min) in ₹	Cost (max) in ₹
0.5HP	2000	5000
1HP	5000	11000

Source: Computed by the researcher through primary data collection

The Table 4.35 and figure 4.10 shows the cost of buying a motor depend on the daily water requirement, 0.5 HP motor has the capacity of 1800 liters per hour whereas 1HP motor has 3600 liters per hour, the former will cost between ₹2000 and ₹5000, and the 1HP will cost between ₹5000 and ₹11000. The informal discussion revealed that the maintenance cost on the motor not observed for 8 to 9 years as the motor was used for very limited time period. The motors were generally replaced after 10years or more and no repair was observed for water motors.

Figure-4.10

Cost of Motor



The cost of water motor forms important part of drinking water infrastructure as fixed cost and electricity consumed by it as an operating cost which is variable in nature.

4.5.7 Labour Cost

Labour is the important cost and is needed for the cleanness of the drinking water infrastructure. The Labour cost is obtained from Labour market on the daily wage basis. The cost of Labour is obtained on daily basis.

Table 4.36

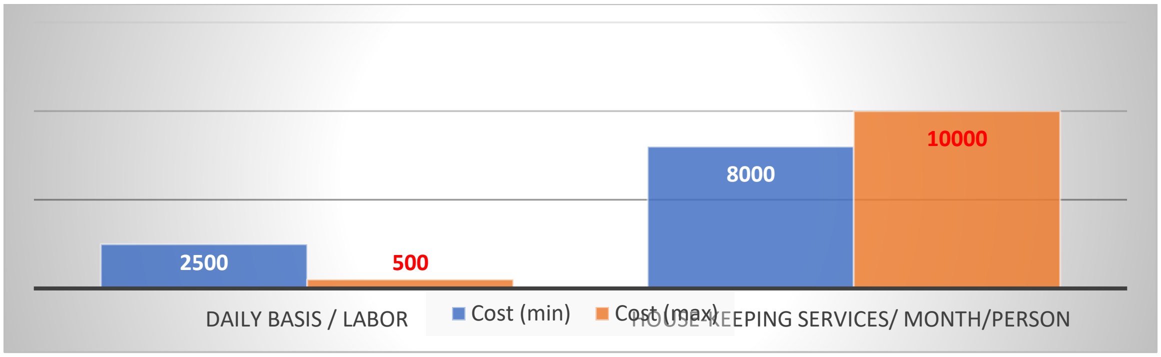
Cost of Labour

Type	Cost (min) in ₹	Cost (max) in ₹
Daily basis / Labour	250	500
House-keeping services/ month/person	8000	10000

Source: Computed by the researcher through primary data collection

Figure-4.11

Cost of Labour



The cost of labour depends on the number of labours hired and the required for cleanness. The labour is hired for keeping the drinking water infrastructure clean.

The Table 4.36 and figure 4.11 shows that there were two options available for schools, one is daily wage labour which will cost around ₹2500 to ₹500 for the day and another on monthly basis would cost ₹8000Rs to ₹10000. Monthly option was costlier than daily basis option as it is assumed that the Labour was used only for keeping water tank clean. If the daily basis Labour is called for 10 days to keep water tank clean, it will cost only ₹2500 to ₹5000 exactly half than the cost of monthly basis option.

Labour cost is important part of drinking water infrastructure as it helps in keeping drinking water hygiene and is also a part of Operational and maintenance cost.

4.5.8 Purifier Filter Cost

The cost of purifier filter is obtained from the size of the filters, if the size of the filter is 50LPH (Liters Per Hour) then, it requires three filters replaced every monthly and if the size is 100 then, number of filters required would be 6.

Table 4.37 and bar diagram shows the cost of replacing filter on monthly basis would cost ₹600 to ₹1100 for 50 LPH RO filter and for 100LPH its ₹1000 to ₹2400. Schools' choice for type of RO purifiers and the total number of RO purifier, decides the total cost of filter.

Table 4.37

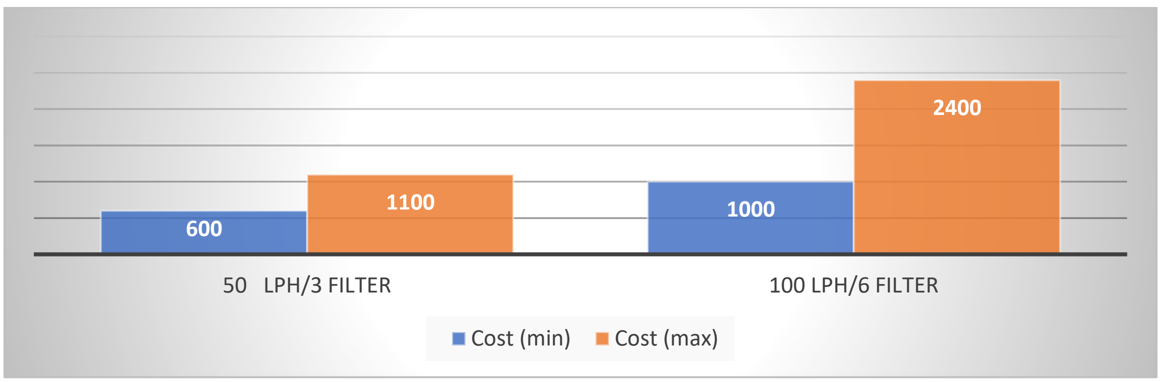
Purifier Filter Cost

Type	Number of Filter	Cost (min) in ₹	Cost (max) in ₹
50 LPH	3	600	1100
100 LPH	6	1000	2400

Source: Computed by the researcher through primary data collection

Figure-4.12

Purifier Filter Cost



The cost of replacement of filters may increase due other factors like the quality of water. If the water is hard then the filters are to be changed more frequently.

In case of city limits, the RO uses the VMC water then, the frequency of changing the filters was found two months among schools. So, the cost of filters occurs every two months. Which is very significant from the cost of operation and maintenance, therefore it is a important part of drinking water infrastructure.

4.5.9 Electricity Cost

The electricity consumption for drinking water is classified on its use and then cost is calculated. The electricity is used for storage to the main drinking water tank of the school, the electricity uses for storage, second point of consumption of electricity is the electricity use for RO filter, and the third point of consumption of electricity is the electricity use for cooler.

Table 4.38

The Use-Based Classification of Electricity Consumption is Given in the Table

Electricity use for	Watts use in the machine	Min-Max time run (minutes)	Cost (min-max) in ₹
Storage of water	900-2400W	15m to 30m	*3.90 ₹ cost per unit will all charges
RO purifier	40-230W	60m to 180m	
Cooler	600-750W	180m to 300m	

Source: *MGVCL and Computed by the researcher through primary data collection.

The Table 4.38 shows electricity used for drinking water infrastructure for storing the water in drinking water tank, for RO purifier system and for water cooler depends upon the Watts of the machine used. The cost of electricity per unit is considered as per the MGVCL for educational institution is ₹3.90/ per unit.

Table 4.39

Cost of Electricity

Electricity use for	Watts use in the machine	Min-Max charge per hour in ₹	Cost (min-max) in ₹
Storage of water	13.5-36kWh	₹3.51-9.36	*3.90 ₹ cost per unit will all charges
RO purifier	40-230W	₹0.16-0.9	
Cooler	600-750W	₹2.34-2.9	

Source- Electric Cost Calculator and Computed by the researcher through primary data

As per Table 4.39, using electricity for storage of water show minimum ₹3.51 cost per hour and maximum ₹9.36. For RO purifier it shows minimum from ₹0.16 to maximum ₹9 And for cooler minimum cost comes to ₹2.34 to maximum ₹2.9. For an instance, hypothetical monthly calculation of electricity used for estimating the monthly minimum and maximum cost to show the significance of the electricity cost.

Table 4.39a

Monthly Calculation of Electricity

Usage	Hr./Day	Working day/month	Monthly Hours	Min. Cost in ₹	Max. Cost in ₹
TabStorage Of Water	0.5	26	13	45.63	121.68
Ro Purifier	4	26	104	16.64	93.6
Cooler	5	26	130	304.2	377
Total				366.47	592.28

Source: Computed by the researcher through primary data collection

Note, Hr./ Day – hours per day

The monthly charge of the electricity is calculated from the hypothetical usage of the RO, Water motor and cooler comes to the ₹366.47 minimum and ₹592.28 Maximum. The electricity charges form a significant part of operational cost and one of the important parts of drinking water infrastructure.

4.5.10 Cost of Bleaching powder (cleaning purpose)

The cost price obtained for bleaching powder vary due to the quantity and the quality (brand) of the beaching powder. The Table 4.40 gives the data on the cost of the bleaching powder.

Table 4.40

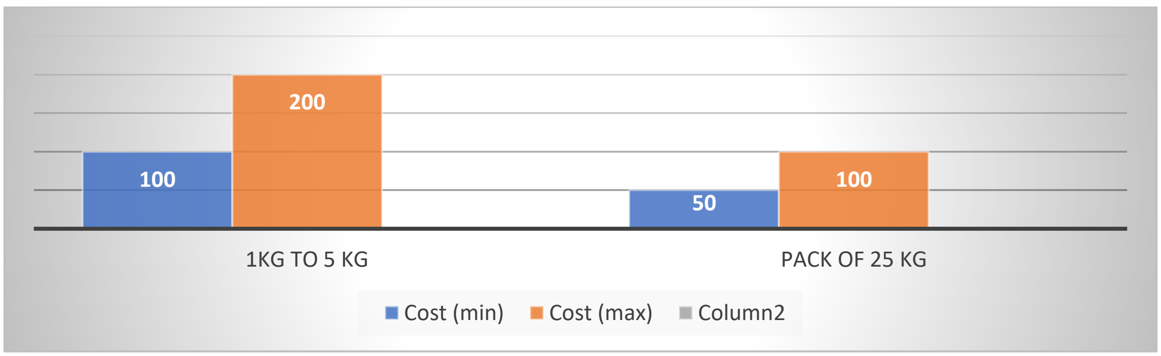
Cost of Bleaching Powder

Type	Cost (min-max) in ₹
1kg to 5 kg	100-200/ kg
Pack of 25 kg	50-100kg

Source: Computed by the researcher through primary data collection

Figure-4.13

Cost of Bleaching Powder



The figure 4.13 shows the price of the bulk buying is almost half of the price i.e., ₹50 to ₹100 per kg, for 25 kg pack and on the other hand the small quantity cost ₹100 to ₹ 200 for 1kg of bleaching powder.

The cost of cleaning material forms very small amount in the total cost of infrastructure. It is a part of operational and maintenance cost and very marginal cost in the total operational and maintenance cost.

4.5.11 Cost of Municipal Tax

Every school is charged with water tax based on the size of the land used by the school varying from ₹0 (zero tax) to ₹4,00,000. Zero tax is levied on the VMC run schools as per the details of current years (2020-21) tax on water.

Table 4.41

Municipal Tax

Ward Wise	Tax on Water
Ward-A	40 % on property tax
Ward-B	25 % on property tax

Source- Computed by the researcher through primary data collection.

Table 4.41 shows that water tax is charged on the basis of property tax and the rate at which it is levied is 40 percent in some ward and 25 percent depending upon their area.

This cost is incurred by the management every year but not for the infrastructure but for the availability of drinking water supply in the educational institution. The cost from the institution point of view is included in the operational and maintenance cost of the drinking water infrastructure as this a significant amount charged for making water available in the schools.

Findings

For the operational and maintenance cost of the drinking water infrastructure, Table 4.32 and Table 4.36, Table 4.37, Table 4.38, Table 4.39, Table 4.40, and Table 4.41 gives the following findings.

The operational cost of the drinking water consists of Labour cost, cost of fillers, cost of taps, cost of electricity and bleaching powder cost and water Tax are identified as operational and maintenance cost

In the first section of the chapter, the detailed analysis of the drinking water infrastructure of the selected schools of Vadodara city concluded the Primary objective and Secondary of objectives of the research (except the secondary objective on Role of Private sectors which is analyzed in the Chapter-5). During the survey the researcher observed that there is a need to take opinion of the student and teachers to know their perception about existing drinking water facility in their schools. The involvement of the student and teachers opinion add some more meaning to study as they are most important stakeholders. The next section of the study details the analysis drawn from the opinion of the important stakeholders of the drinking water facilities.

SECTION-II

STAKEHOLDERS PERCEPTION
ON
DRINKING WATER PARAMETERS

This part of the chapter discusses about the perception of the stakeholders regarding the drinking water facilities in their school. Stakeholders' perception was measured on various parameters related to drinking water facilities. A better understanding of the practices/facilities affecting stakeholder perception can contribute to improving drinking water facilities in schools.

There are two categories of stakeholders: the first stakeholder is the teachers, and the second stakeholder is the students.

4.6 TEACHERS PERCEPTION

4.6.1 Profile of Respondents

The analysis of the respondent is discussed to give the brief background of the respondent from Table 4.42 to Table 4.45 on age, gender, total years of experience and total years of experience in the present school.

Table 4.42

Age

		Frequency	Percent
Valid	Years 20-30	12	25.5
	Years 31-40	15	31.9
	Years 41-50	14	29.8
	Years 51-60	6	12.8
	Total	47	100.0

Source- Computed by the researcher through primary data collection.

The Table 4.42 shows the age of the respondent teaching in the schools. 25.5 percent of the respondents belong to the age group of 20-30 years. Respondents with 31-40 years age group with highest response of 31.9 percent followed by 29.8 percent belonging to the age group of 41-50 years. The oldest age group has the lowest percentage of 12.8 having age group of 51-60 years.

The participation of the young teachers is more than 50 percent which shows their active participation.

Table 4.43

Gender

		Frequency	Percent
Valid	Female	25	53.2
	Male	21	44.7
	Not to say	1	2.1
	Total	47	100.0

Source- Computed by the researcher through primary data collection.

The Table 4.43 shows the gender of the respondent, male or female. The male respondent was only 44.7 percent compared to the female respondent with 53.2 percent. Only 2.1 percent prefer not to specify the gender.

The respondents, male and female, indicate that data was collected impartially and is free from gender bias.

Table 4.44

Total Years of Experience

		Frequency	Percent
Valid	0-5years	6	12.8
	6-10years	11	23.4
	11-20years	22	46.8
	21-30 years	8	17.0
	Total	47	100.0

Source- Computed by the researcher through primary data collection.

The Table 4.44 gives information about the total experience of the teachers. It indicates that around 47 percent of the teachers had 11-20 years of experience, followed by 23.4 percent of the teachers having teaching experience of 6-10 years. The teachers with maximum teaching experience were 17 percent and 0-5 years' experience were the lowest i.e., 12.8 percent. It shows the neutral view of the teachers with total years of experience on the various parameters.

Table 4.45

Experience in the current schools

		Frequency	Percent
Valid	0-5years	15	31.9
	6-10years	12	25.5
	11-20years	16	34.0
	21-30 years	4	8.5
	Total	47	100.0

Source- Computed by the researcher through primary data collection.

The Table 4.45 analyses the respondents' experience with the current schools they are working. The data shows that 31.9 percent of the teachers had 0-5 year of experience of working with the current school. Around 25.5 percent of the teachers were working with same school for 6-10 years of experience. Teacher with 11-20 years of experience working in the school were 34 percent and the most experienced teacher were only 8.5 percent.

The respondent having different years of experience shows independent response as the difference in frequency of the respondent are not much, except the 21-30 years of experience.

4.6.2 Teacher on procuring drinking water from home or school

Table 4.46

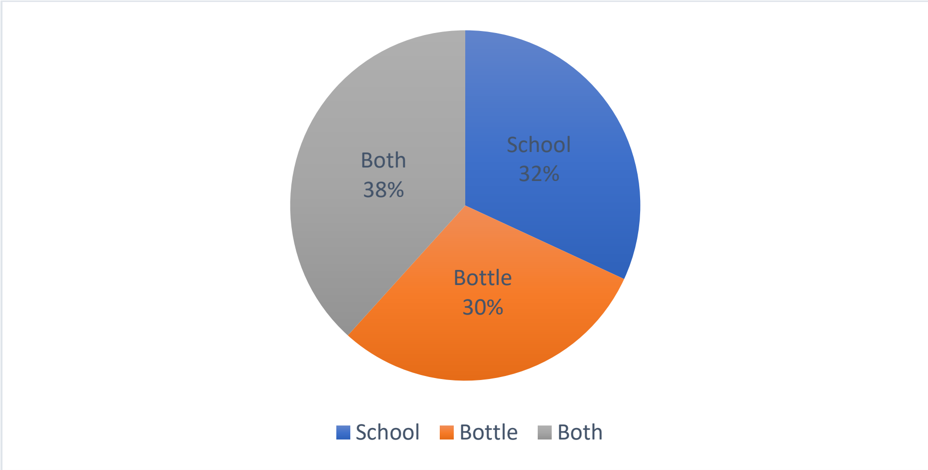
Procuring Drinking Water

		Frequency	Percent
Valid	School	15	31.9
	Bottle	14	29.8
	Both	18	38.3
	Total	47	100.0

Source- Computed by the researcher through primary data collection.

Figure-4.14

Procuring Drinking Water



The Table 4.46 shows the response of the teacher on procuring drinking water from home or school. The respondents drinking water from the school was 31.9 percent whereas respondents procuring water from their school show 29.8 percent. The respondents who preferred drinking water from bottle as well as schools both, as an option recorded the highest 38.3 percent.

Pie chart (figure no. 4.14) shows information about the teachers procuring drinking water from home, school, or both. 31.9

From the above figure it was found that 70 percent of the teachers find their schools drinking water drinkable and are dependent on the school drinking water completely (32 percent) or partially (38 percent), whereas 30 percent of the teachers preferred to drink their own drinking water from the bottled water.

4.6.3 Cronbach's Alpha Test

The perception of the respondent was measured on the scale of 1 to 5 showing their different perception. The scale that has been taken to measure the perception was to test for internal consistent of scale. The Cronbach's Alpha test is used to measure the multiple Likert question and the scale is reliable or not. If the table41 value of Cronbach's Alpha is:

Table 4.47

Value of Cronbach's Alpha

Value of Cronbach's Alpha	Internal Consistency
More than 0.9	Excellent
0.9-0.8	Good
0.8-0.7	Acceptable
0.7-0.6	Questionable
0.6-0.5	Poor
Less than 0.5	Unacceptable

Source- (*Cronbach's alpha, 2022)*

Table 4.48

Reliability Statistics

Cronbach's Alpha	N of Items
.923	11

In the Table 4.41a the result of the test shows the value of Cronbach's Alpha is .923 which is above 0.7 showing the internal consistency of the scale is acceptable and the .923 value is considered as excellent internal consistency of the scale. The responses measured on the scale of 1 to 5 from the respondent on the selected parameters are reliable and consistent.

4.6.3.1 Descriptive Statistics

The response of the teacher was obtained on the scale of 1 to 5 showing different level of perception towards the individual parameters on drinking water in the schools. The scale 1 to 5 is interpreted as follows

1- Shows worst opinion / opined worst
2- Shows poor opinion / opined poor
3- Shows average opinion / opined average
4- Shows good opinion / opined good
5- Shows excellent opinion / opined excellent

Table 4.49

Perception of the Teachers

Descriptive Statistics				
S.No.	Parameter	N	Mean	Std. Deviation
1	Quality	47	4.255	.6416
2	Quantity	47	4.234	.6664
3	Taste	47	4.170	.5641
4	Availability	47	4.255	.6416
5	Adequate number of taps	47	4.128	.7407
6	Location of water station	47	4.000	.7223
7	Hygiene (sanitizing, cleaning of water tank)	47	4.064	.8699
8	Cleanliness around water station	47	3.936	.7634
9	Availability of glasses for drinking water	47	3.681	.8873
10	Cleanliness of drinking glasses	47	3.766	.9140
11	Overall Arrangement about drinking water	47	4.043	.7210
	Valid N (listwise)	47		

Source- Computed by the researcher through primary data collection.

Parameter-1 Quality of Drinking Water

The finding shows that the opinion of the teachers towards the drinking water quality in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

Parameter-2 Quantity Drinking Water

The mean value of the response was calculated as 4.234 and the standard deviation of .6664.

The finding shows that the opinion of the teachers towards the quantity of the drinking water in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

Parameter-3 Taste Drinking Water

The mean value of the response was calculated as 4.170 and the standard deviation of .5641.

The finding shows that the opinion of the teachers towards the taste of the drinking water in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

Parameter-4 Availability Drinking Water

The mean value of the response was calculated as 4.255 and the standard deviation of .6416.

The finding shows that the opinion of the teachers towards the availability of the drinking water in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

Parameter-5 Adequate number of taps

The mean value of the response was calculated as 4.128 and the standard deviation of .7407.

The finding shows that the opinion of the teachers towards the Adequate number of taps in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

Parameter-6 Location of water station

The mean value of the response was calculated as 4.000 and the standard deviation of .7223.

The finding shows that the opinion of the teachers towards the Location of water station in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated as Good.

Parameter-7 Hygiene for Drinking Water

The mean value of the response was calculated as 4.064 and the standard deviation of .8699.

The finding shows that the opinion of the teachers towards the Hygiene for Drinking Water in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

Parameter-8 Cleanliness around water station

The mean value of the response was calculated as 3.936 and the standard deviation of .7634.

The finding shows that the opinion of the teachers towards the Cleanliness around water station in their respective schools are opined as above average. The value of the mean is representing the opinion between above average and very close to be Good.

Parameter-9 Availability of glasses for drinking water

The mean value of the response was calculated as 3.681 and the standard deviation of .8873.

The finding shows that the opinion of the teachers towards the Availability of glasses for drinking water in their respective schools are opined as just above average. The value of the mean is representing the opinion between just above average and away from Good.

Parameter-10 Cleanliness of drinking glasses

The mean value of the response was calculated as 3.766 and the standard deviation of .9140.

The finding shows that the opinion of the teachers towards the Cleanliness of drinking glasses in their respective schools are opined as just above the good. The value of the mean is representing the opinion between just above average and near to Good.

Parameter-11 Overall Arrangement about drinking water

The mean value of the response was calculated as 4.043 and the standard deviation of .7210.

The finding shows that the opinion of the teachers towards the Overall Arrangement about drinking water in their respective schools was opined as good. The value of the mean is showing that the quantity of the water in the school is rated just above Good.

4.6.4 Findings

- The comprehensive finding of the analysis from the Table 4.49 concludes that the drinking water infrastructure of the schools are good with the approximate value of the means of mean is 4.05. The perception of the teachers concludes that the drinking water infrastructure of the school in the city of Vadodara is good.
- The 30 percent of the teachers did not accept the drinking water of the school highlighted in the figure 4.14.

4.7 STUDENTS PERCEPTION

4.7.1 Profile of Respondents

The profile of the respondents gives information about the class, age, gender of the students and years spent in the current school for the purpose of data collection.

4.7.1.1 Class

The Table 4.50 shows the class of the respondent studying in the schools. The 50 percent of the respondents belongs to the 6^{th} to 9^{th} class with highest proportion due to inclusion of four classes followed by 22.4 percent from class 12^{th} and 17.8 percent from 11^{th} class. The class 10^{th} students responded among the population was only 9.9 percent.

Table 4.50

Class

Class	Frequency	Percent
Standard 6-9	76	50.0
Standard 10	15	9.9
Standard 11	27	17.8
Standard 12	34	22.4
Total	152	100.0

Source- Computed by the researcher through primary data collection.

4.7.1.2 Age

The Table 4.51 gives the details of the respondent on the age category of the respondent. The highest respondent belongs to the age category of the 11 to 15 years, forming 50.7 percent followed by age category 16 to 18 years responded 31.6 percent. Age group between 18 to 19 responded only 13.8 percent and age below 11 years with the lowest percentage of 3.9 percent respondent.

Table 4.51

Age

	Frequency	Percent
Below 11	6	3.9
Years 11-15	77	50.7
Years 16-18	48	31.6
Years Below 19	21	13.8
Total	152	100.0

Source- Computed by the researcher through primary data collection.

4.7.1.3 Gender

The Table 4.52 shows the gender of the respondent, male or female. The female respondent is respondent only 44.7 percent compared to the male respondent with 55.3 percent.

Table 4.52

Gender

	Frequency	Percent
Female	68	44.7
Male	84	55.3
Total	152	100.0

Source- Computed by the researcher through primary data collection.

4.7.1.4 Years Spent in the School

The Table 4.53 shows the number of years spent in the school. The data showing students spent less than 3 years with schools responded 46.1 percent followed by the student spent 3-5 years was 25 percent. Student spent relatively more than 6-9 years and above 10 years are only 12.5 percent and 16.4 percent respectively.

Table 4.53

Years Spent in the School

	Frequency	Percent
less than 3years	70	46.1
3-5years	38	25.0
6-9years	19	12.5
above10years	25	16.4
Total	152	100.0

Source- Computed by the researcher through primary data collection.

4.7.2 Cronbach's Alpha Test

In the Table 4.54 the result of the test shows the value of Cronbach's Alpha is .937 which is above 0.7 shows the internal consistency of the scale is acceptable and the .937 value is considered as excellent internal consistency of the scale. The responses measured on the scale of 1 to 5 from the respondent on the selected parameters are reliable and consistent (*Cronbach's alpha, 2022)***.**

Table 4.54

Reliability Statistics

Cronbach's Alpha	N of Items
.937	11

Source- Computed by the researcher through primary data collection.

4.7.2.1 Descriptive Statistics

The perception of the students was known through filling the online questionnaire by the school going students in the city of the Vadodara.

The students were asked to give their opinion on the water infrastructure used by them in their respective schools. Table 4.55 analyses the response of the students on the different parameters of the drinking water infrastructure.

Table 4.55

Descriptive Statistics

Parameter		N	Mean	Std. Deviation
1	Quality	152	3.921	.9527
2	Quantity	152	4.046	.9374
3	Taste	152	3.717	.9165
4	Availability	152	4.059	.9224
5	Adequate number of taps	152	3.829	.9191
6	Location of water station	152	3.697	1.0799
7	Hygiene (sanitizing, cleaning of water tank)	152	3.651	1.0812
8	Cleanliness around water station	152	3.632	1.0777
9	Availability of glasses for drinking water	152	3.197	1.2609
10	Cleanliness of drinking glasses	152	3.270	1.2447
11	Overall Arrangement about drinking water	152	3.658	1.0300
	Valid N (listwise)	152		

Source- Computed by the researcher through primary data collection.

The response of the student was obtained on the scale of 1 to 5 showing different level of perception towards the individual parameters on drinking water in the schools. The scale 1 to 5 is interpreted as follows

1- Shows worst opinion / opined worst
2- Shows poor opinion / opined poor
3- Shows average opinion / opined average
4- Shows good opinion / opined good
5- Shows excellent opinion / opined excellent

Parameter-1 Quality of Drinking Water

The student's perception on the quality of drinking water was collected on the scale of 1 to 5 level showing. The mean value of the response was calculated as 3.921 and the standard deviation of .9527.

The finding shows that the opinion of the students towards the drinking water quality in their respective schools are opined as above average and near to good.

Parameter-2 Quantity Drinking Water

The mean value of the response was calculated as 4.046 and the standard deviation of .9374.

The finding shows that the opinion of the students towards the quantity of the drinking water in their respective schools are opined as good. The value of the mean is showing that the quantity of the water in the school is rated above Good.

Parameter-3 Taste Drinking Water

The mean value of the response was calculated as 3.717 and the standard deviation of .9165.

The finding shows that the opinion of the students towards the taste of the drinking water in their respective schools are opined as above average. The value of the mean is representing the opinion between average and less than good.

Parameter-4 Availability Drinking Water

The mean value of the response was calculated as 4.059 and the standard deviation of .9224.

The finding shows that the opinion of the students towards the availability of the drinking water in their respective schools is opined as good. The value of the mean is representing the opinion above good.

Parameter-5 Adequate number of taps

The mean value of the response was calculated as 3.829 and the standard deviation of .9191.

The finding shows that the opinion of the students towards the Adequate number of taps in their respective schools is opined as above average. The value of the mean is representing the opinion above average and near to good.

Parameter-6 Location of water station

The mean value of the response was calculated as 3.697 and the standard deviation of 1.0799.

The finding shows that the opinion of the students towards the Location of water station in their respective schools is opined as above average. The value of the mean is representing the opinion between above average and less than good.

Parameter-7 Hygiene for Drinking Water

The mean value of the response was calculated as 3.651 and the standard deviation of 1.0812.

The finding shows that the opinion of the students towards the Hygiene for Drinking Water in their respective schools is opined as above average. The value of the mean is representing the opinion between above average and less than good.

Parameter-8 Cleanliness around water station

The mean value of the response was calculated as 3.632 and the standard deviation of 1.0777.

The finding shows that the opinion of the students towards the Cleanliness around water station in their respective schools is opined as above average. The value of the mean is representing the opinion between above average and less than good.

Parameter-9 Availability of glasses for drinking water

The mean value of the response was calculated as 3.197 and the standard deviation of 1.2609.

The finding shows that the opinion of the students towards the Availability of glasses for drinking water in their respective schools is opined as just above average. The value of the mean is representing the opinion between just above average and away from good.

Parameter-10 Cleanliness of drinking glasses

The mean value of the response was calculated as 3.270 and the standard deviation of 1.2447. The finding shows that the opinion of the students towards the Cleanliness of drinking glasses in their respective schools is opined as just above the good. The value of the mean is representing the opinion between just above average and away from good.

Parameter-11 Overall Arrangement about drinking water

The mean value of the response was calculated as 3.658 and the standard deviation of 1.0300. The finding shows that the opinion of the students towards the Overall Arrangement about drinking water in their respective schools are opined as good. The value of the mean is representing the opinion between average and good.

4.7.3 Findings

- The comprehensive finding of the Table 4.55 concludes that the drinking water infrastructure of the schools is opined as average with the approximate value of the means of mean is 3.7. The perception of the students concludes that the drinking water infrastructure in the city of Vadodara is not good, and it is below the Good.

At the end of the second part, on the basis of opinion of teachers and students regarding drinking water facility in their school, it is concluded that there is a difference in the opinion of students and teachers. Students rated their drinking water facilities as "average" while teachers rated them as "good". The researcher found that there is a difference of opinion between teachers and students regarding drinking water facilities. During the visit to the school, the researcher found that the school had separate arrangements for drinking water for teachers and students. This can be a strong reason for the difference of opinion.

Most schools had packaged drinking water from a local RO water supplier in a 20 liter water jug (plastic insulated thermos water camper) for the teacher. During an informal discussion on the burden bearing the cost of bottled water, it was revealed that some teachers contribute for themselves, and some schools are bearing the burden which is very nominal.

At last, understanding the factors shaping the perception of drinking water facilities in schools is an important step in developing policies aimed at increasing compliance with stakeholders. Underlining these parameters would be an important step in policy making.

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