DL - 06
Language: English

30th National Children's Science Congress

2022-23

Focal Theme: Understanding of Ecosystem for Health and Well-being
Sub Theme: Technological innovation for ecosystem and health

Title of the Project

H2All – Clean and affordable drinking water for all

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Group Leader: Mokshit Jain, 11A
Group Member: Navya Gupta, 11A

School: Montfort School, Ashok Vihar, Phase-1, Delhi -52

Form A

30th National Children's Science Congress 2022

Registration Form - A

Fill the Form in Capital Letters and Submit to the State Coordinator

1. State: Delhi
2. District: NORTH-WEST DELHI
3. Sub-Theme: TECHNOLOGICAL INNOVATION FOR ECOSYSTEM AND HEALTH
4. Title of the Project H2ALL
5. Language Used: ENGLISH Area (Rural/ Urban): URBAN
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Signature of the Guide Teacher

Name and Signature of the Coordinator Date:

Abstract

30th NATIONAL CHILDREN'S SCIENCE CONGRESS 2022

STATE- Delhi STATE CODE: DL-06

Language: English Category:Upper

Area of Participation:Urban

Title : H2All

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ABSTRACT

The objective of our project is to identify the water related problems faced by people in Delhi, compare the quality of water supply in various parts of the city, determine the mineral and nutrient content of water, and assess the working of water purifiers. The hypothesis of this research is that Reverse Osmosis (RO) water is devoid of important minerals and this lack of minerals is the cause of cardiovascular diseases. ROs also waste almost 75% of the water taken.

We conducted a survey in Delhi using Google Forms, which received 112 responses from different parts of the city. The results of the survey showed that over 60% of respondents believed that their drinking water had a foul odour or taste. Two-thirds of the respondents had also suffered from some form of waterborne disease in the past, with diarrhoea being the most common. Approximately 8% of respondents did not use any form of modern purification system, and about 63% of them drink RO water.

The solution proposed in this research is to build a cost-effective and more than 10 times more affordable water purifier, making it feasible for people who cannot afford a traditional RO system. The purifier would save water, remineralize water filtered by it, provide an outlet for the concentrate/waste water so that it can be used for household purposes, and purify water using a combination of the latest technology and past research.

In conclusion, this research aims to address the water-related problems faced by people in Delhi and proposes a solution to build a sustainable and affordable water purifier. The survey

conducted as part of this research shows the need for such a solution, with a significant proportion of respondents experiencing water-related problems and most of them using RO water for drinking.

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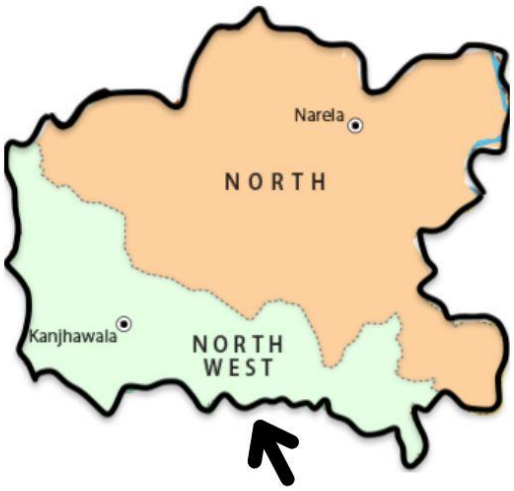
Name & Address of Guide Teacher: Mrs. Jyoti Khandelwal, Street No. 9B, near RGPG CNG Motors, Jagatpur village, Delhi, PIN: 110084

Phone: 9891191341

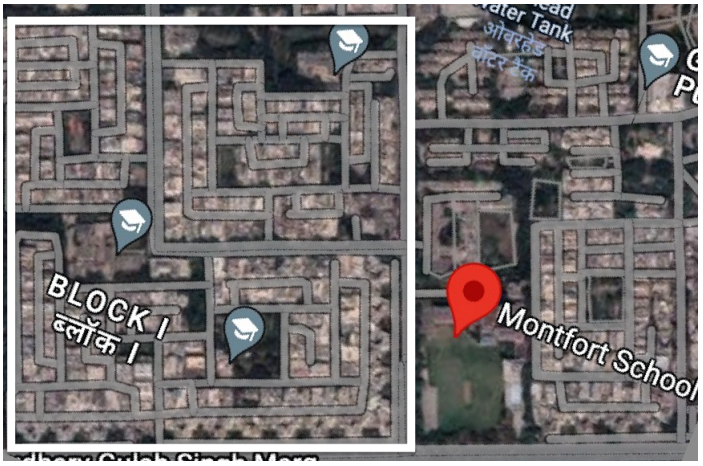
Contents

Sketch Map of the Study Area

North & North-West Delhi



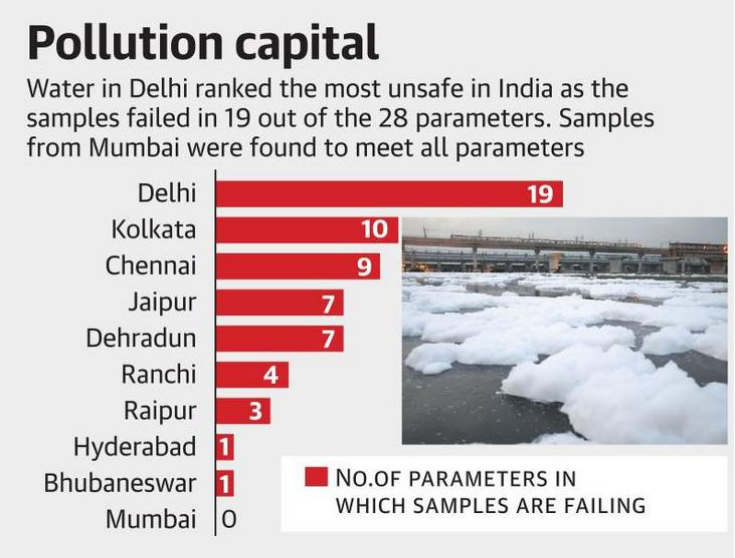
Houses near school campus



Introduction

In the past decade there has been a huge improvement in tap water supply in various parts of India due to government organised programmes such as *Jal Jeevan Mission* but that water is still not up to the standards.

According to the **Bureau of Indian Standards** (BIS) report of Testing of Piped Drinking from 2019[1], 15 out of 21 cities failed to meet one or more safety parameters during testing, and Delhi's water ranked the **worst**, **failing 19 out of the 28 parameters** as prescribed for drinking water standards of BIS. It also conformed with parameters for **toxic substances** and **pesticide residue**.



Comparison of water quality report of BIS[2]

This water, without any means of proper purification, is **unfit for consumption**, and also leads to deadly waterborne diseases.

The existing water purification systems that filter out these impurities cost anywhere from ₹15,000-₹25,000, and are **too expensive** for the low-income families to afford. These families are unable to afford these purifiers and end up being a victim of such diseases.

Even most of these ROs **remove necessary minerals**[3] that are essential to human health. Consumption of water stripped of natural minerals has adverse effects on our well-being.

The cheaper purifiers don't filter out bacteria and microorganisms and still possess a threat.

Hypothesis

The water purifiers available in the market are too expensive for low income families to afford and water supply in their areas is highly contaminated. Additionally, water filtered by most ROs lacks essential minerals.

We believe that this lack of minerals, extremely expensive ROs, and poor water condition is what is leading to the spread of these diseases at an alarming rate.

Companies also sell ROs at very high margins, and we believe a purifier that matches their standards could be made for **a** lot cheaper.

Objectives

1. To identify the water related problems, mineral content and quality of water supply in Delhi.
2. To compare the quality of drinking water produced by tap, filter and RO.
3. To assess the working and costing of a water purifier.
4. To determine the characteristics of an optimum water purifier for a low-income household in Delhi.
5. To provide safe and clean drinking water for underprivileged people by building a suitable and affordable water purifier.

Methodology

Through this study we aim to collect data about the sources, supply, frequency of water etc. in Delhi and compare it with the recommended levels.

We needed qualitative, quantitative as well as experimental data which we obtained from both primary and secondary sources ie. collected through self and through the internet.

Additionally, we used data to make a prototype of a water-purifier that is affordable by the underprivileged and is on par with expensive ROs in the market.

- **Collecting data:**
  - Conducted a survey on the people from all parts of Delhi on google forms. It received responses from 112 houses. (refer to enclosures 1 and 2).
  - Verbal survey of respective domestic helps
  - Collected statistics by *WHO*[3], *CWMI*[4], *Times of India*[5] and other such publications.
  - Find the major contaminants found in India and Delhi's water supply and study the diseases they cause and how they are treated.
- **Case Study**
  - Most of our responses were from North Delhi so we considered that as our study area.
  - This area contained a mixed response from middle class and lower class families.
  - The main learning outcomes were that 2 out of every 3 had faced some or the other water-borne disease in the past 3-4 years and that 65% of the respondents were not satisfied with the quality.
  - For process documentation, view enclosure 4.
- **Analysis:**
  - Analyse existing statistics
  - Use pie charts and histograms generated by google forms to analyse the responses by the people.
  - Additional graphs of selected groups were manually made using microsoft excel and average, range etc. were calculated to draw out specific conclusions.
- **Experiments:**

- Experimentation to draw a comparative study between water produced by tap, cheaper filters and RO, in school laboratory.
- Survey conducted in 20 houses in an apartment complex in front of our school by providing the respondents with 2 water samples (remineralized and lacking minerals) to get their opinion on its odour and whether they would drink it. (refer to enclosure 3)

- **Implementing our solution:**
  - Bought parts such as Carbon Filter, Sediment Pre Filter, Booster Pump and Semi Permeable Membrane, and claypot from local shops and manufacturers.
  - Further bought mineral stones, calcite crystals and activated carbon particles for the custom remineralizer that adds important minerals in water, and UV lamp make a UV filter to kill bacteria.
  - Assembled all the components and wiring up over the span of a few days, with some help from a technician.
  - Quantitatively determined the water quality of our water purifier prototype by *Delhi Water and General Test Laboratory Pvt. Ltd*. (refer to enclosure 5 and 6), a laboratory certified by MCD Delhi.

Reason for Selection of Topic

We had been constantly observing that our house helps, and even relatives reported about water problems in their areas. These problems included high levels of contamination, irregular supply and unsatisfactory water quality. Moreover, our domestic help complained about the rising cost of any decent RO in the market. The urge to help them out in any way gave us a strong motivation to use technological innovations and study the cause of these and come up with a solution which would help people in underprivileged areas to get access to good quality water at an affordable price.

Action Plan

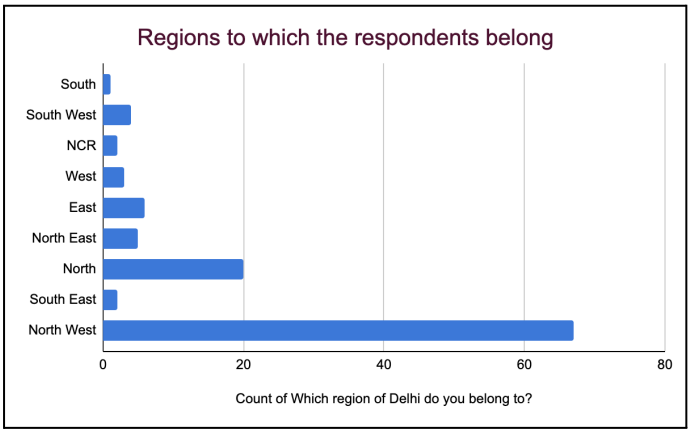
1. Understand the root of the water related problems faced by people in India.
2. Research about water purification methods mainly used and their cost.
3. Gather statistics and data about water supply and quality levels in Delhi and compare it with levels set up by the government.
4. Survey people on the water condition in their areas.
5. Analyse the responses on the survey, find important patterns and draw significant conclusions from it.
6. Conduct a comparative study by carrying out a qualitative analysis of water samples from different water sources.
7. Understand the working of ROs and water purifiers.
8. Build a cost effective water purifier which incorporates the limitations of an RO and other filters.
9. Test the working of our purifier. Further, get the filtered water produced by it by a water testing laboratory as well as compare it with the Indian standard of drinking water (as provided by BIS[1]).

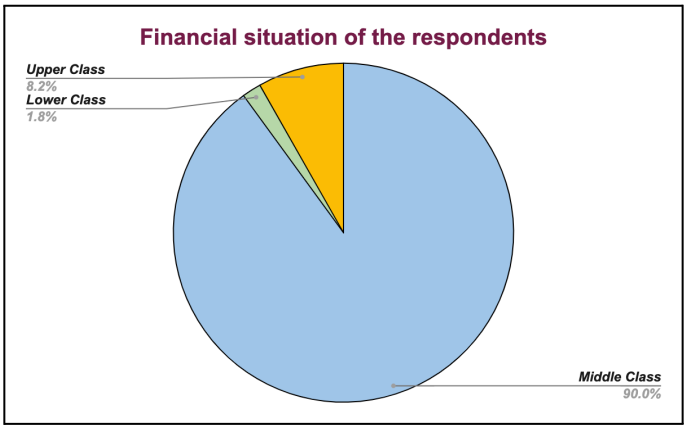
Survey and Experiments

Google Forms Survey

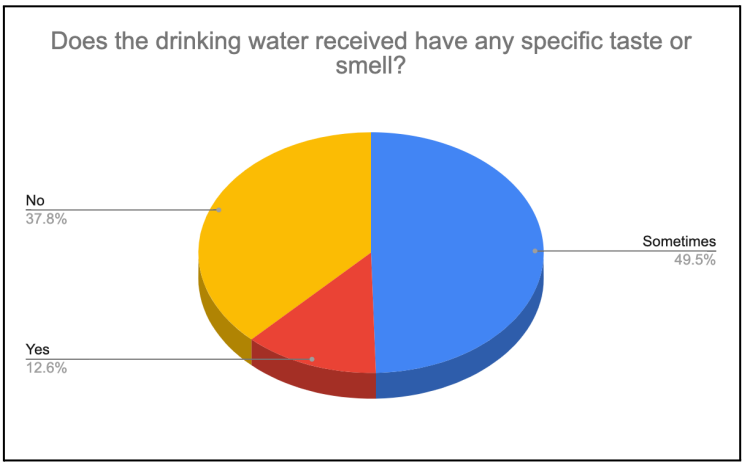
A survey (refer to enclosure 1) was conducted on google forms which received responses from 112 houses from all over Delhi. The questions were of the form: multiple choice, likert scale, short-answer text as well as checkboxes.

79.1% of the respondents belonged to the North and North-West Delhi region. 91.8% of them belong to middle class and lower class families, which are the target of our research.

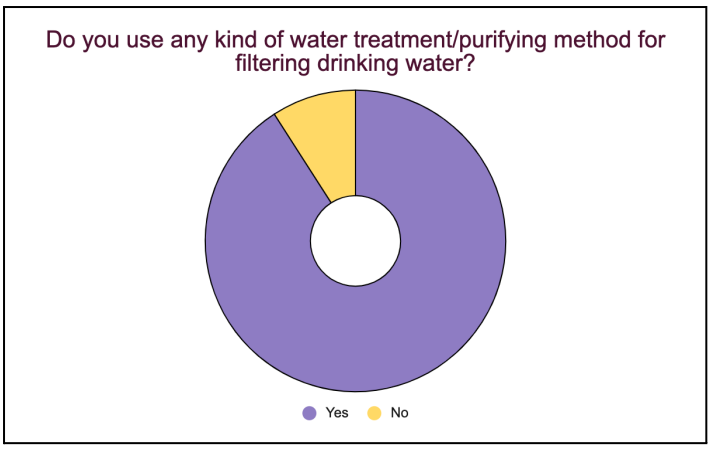


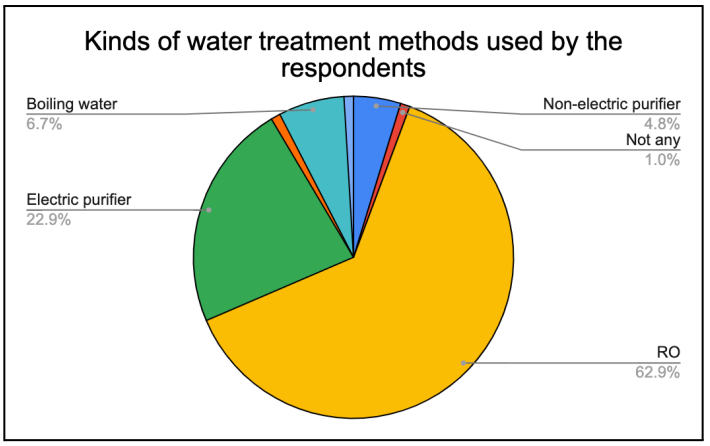


In the survey, the respondents were asked whether the drinking water they receive has any specific taste or odour, to which 49.5% said it ‘sometimes’ does and 12.6% replied in the affirmative.

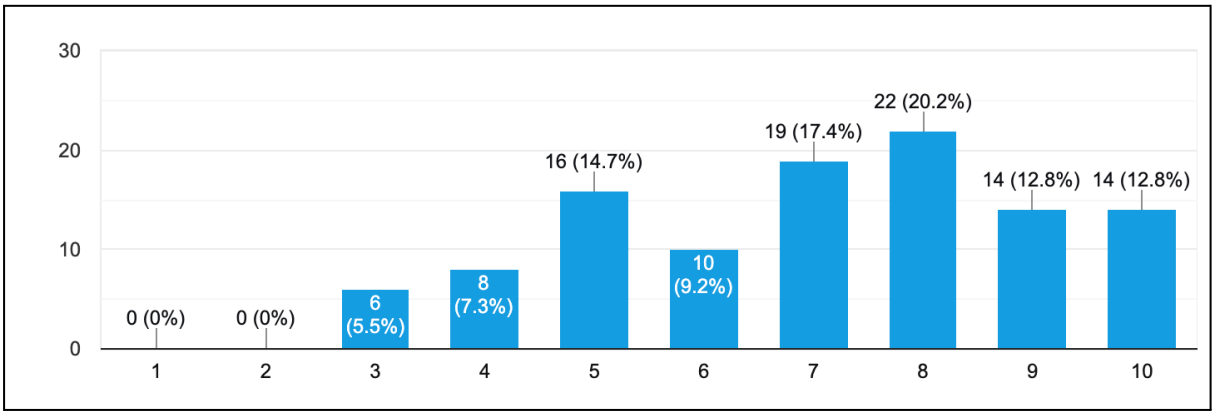


90.9% of the respondents use some kind of water treatment method. The most used method is RO (Reverse Osmosis) (62.9%) followed by electric purifiers (22.9%).

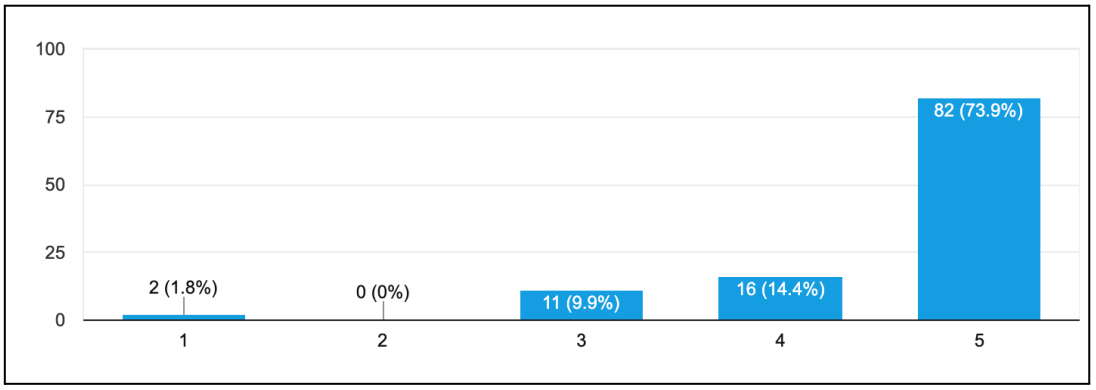




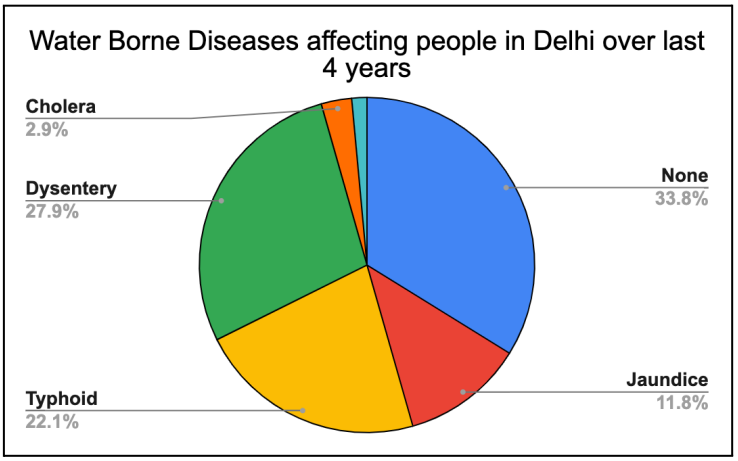
The following chart depicts the level of satisfaction (on a scale of 1 to 10) with the quality of drinking water received by people in their houses:



When asked, how important do those individuals consider spending money on clean and safe drinking water, a major proportion (73.9%) said that they consider it extremely important (5, on a scale of 1 to 5).



The survey asked the respondents whether they had suffered from any water borne diseases in the last 4 years. Over two-thirds of them had suffered from some or the other water borne disease in the last 4 years 27.5% had suffered from dysentery and 21.7% from typhoid.



Comparative Study of 3 Water Samples

We carried out 5 experiments on the following water samples:

1. Tap water
2. RO water
3. Electric filter water

to draw out a comparative study (refer to enclosure 4) on the quality of water produced by them.

Following are the results:

Name of experiment	Tap Water	RO water	Electric Filter Water
1. pH paper test	Mildly alkaline	neutral	Very alkaline
2. Presence of organic impurities	None	None	None
3. Presence of zinc or iron	Zinc present	Zinc present in very small quantity	Zinc present
4. Presence of carbonic acid	Present in little amount	Present in little amount	Present in little amount
5. Hardness of water (in ppm)	300	100	300

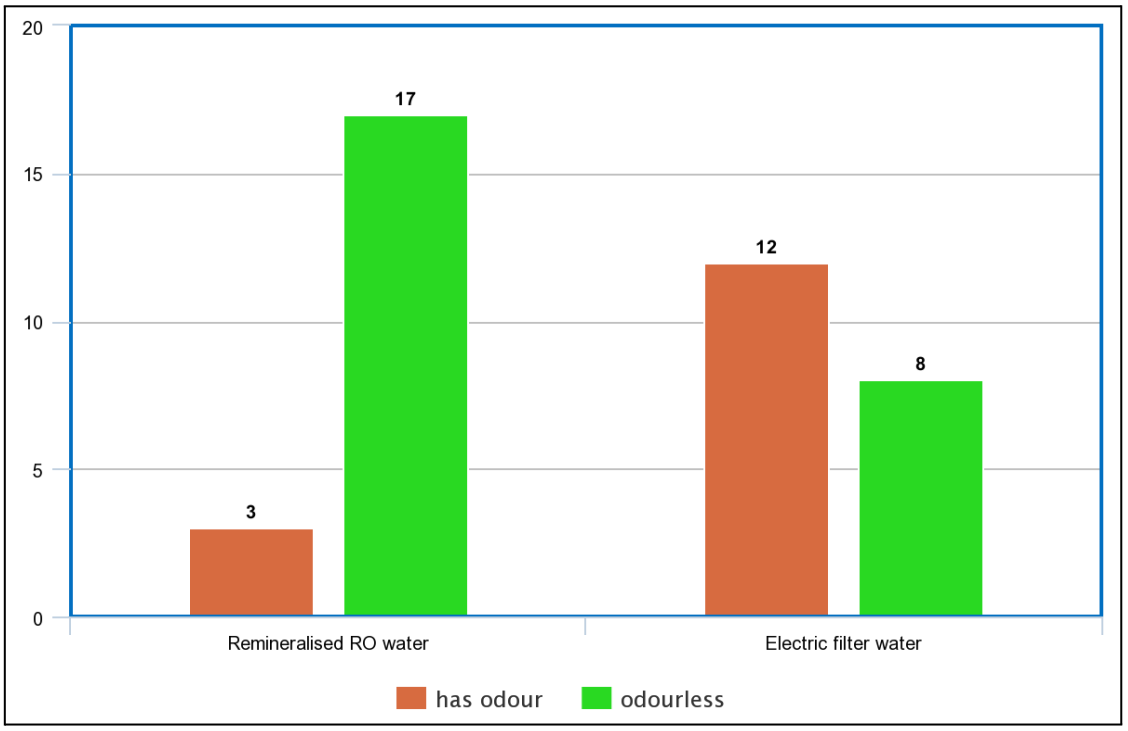
Survey on Odour

We carried out a survey on 20 people (refer to enclosure 3) in which we asked them to smell 2 water samples:

1. Remineralised RO water
2. Electric filter water

To conclude whether they have any specific odour and if they would prefer drinking it.

Following is the result:



Bar graph: Survey on presence of odour in water samples

Analysis of Data

- From the results of our survey, it is clear that people are not fully satisfied with the quality of the drinking water they receive.
- They consider it really important to spend money on clean drinking water. However, only about **60%** of them are able to afford ROs as they are available at skyrocketing rates in the market.
- More than half of the respondents believe that the purified water may sometimes have a specific taste or odour which further deteriorates the quality of the drinking water.
- The result that about 63% of the respondents use ROs suggests that people are nowadays inclining and depending more towards technology for water purification which is a good step for society.
- About 6.7% of the respondents use boiling as a water treatment method. Boiling water does not filter out fluorides which can lead to brittle bones and be toxic. Normal water filters, which are used by 4.8% of the respondents, do not kill harmful bacteria. It can be inferred that about **38%** of the respondents are drinking water which is **unsafe** in some or the other way.
- Moreover, **two-thirds** of the respondents have suffered from some or the other water borne diseases in the past 4 years with dysentery and typhoid being the most common ones.

Hence, our hypothesis was proved to be true.

Result and Conclusion

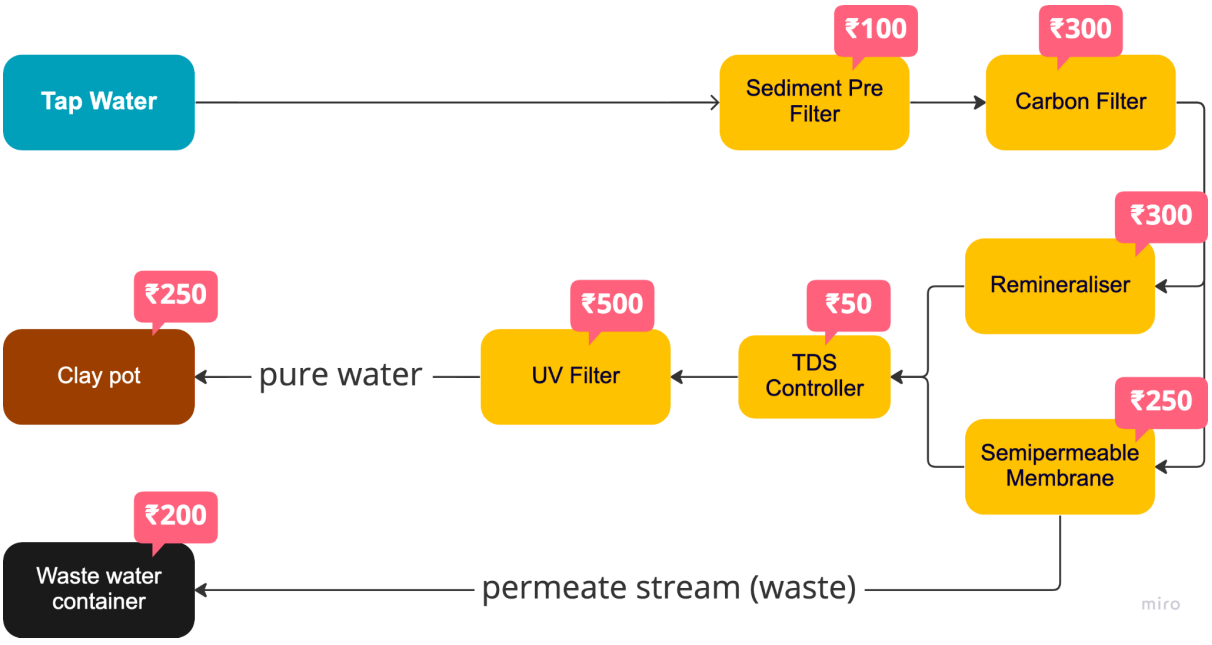
In this study, we surveyed 132 houses in Delhi and gathered data from them. We found out that a lot of these people did not have access to purifiers that could properly filter out harmful bacteria, for example, boiling water does not filter out fluorides which can lead to brittle bones and be toxic, which lead to them being a victim of the disease. At the same time we found out that people were also not satisfied with the quality of water they were receiving and that ROs filter a lot of healthy minerals, absence of which could lead to bone conditions like Osteoporosis. Thus, it can be concluded that unclean drinking water continues to affect the lives of a large proportion of people living in Delhi negatively.

We believe that having an affordable water purifier that uses technology as good as expensive ROs accessible to the underprivileged would highly reduce this spread.

Our Solution

Based on the above conclusion, our team came up with a solution – A cost-effective water purifier which targets the contaminants found in Delhi's water supply, remineralises the water adding the minerals that the water is deficient of, removes all the microorganisms and bacterias from it and does all of this at a cost that is **affordable by low income families**. It works in the following phases:

Assembly of our prototype



Remove Solid Impurities [1] The tap water enters the unit from the water supply and passes through a *Sediment Pre-Filter* and *Carbon Filter*.

The Sediment Pre-Filter removes all the sediments or suspended solids. It sieves or holds back physical impurities like dust, dirt, sand, silt, clay, and other solid particles.

The Carbon Filter consists of activated carbon which because of its large surface area is useful for adsorbing harmful inorganic contaminants, removing bad smell and colour and chlorine.

Mineralisation [2] Now the water gets divided into 2 water channels.
One of them passes through our self-made *remineralizer* which consists of mineral stones, calcite crystals and activated carbon particles in the ratio that is determined based on the nature of the location's water. The calcite crystals are used to correct pH and improve calcium content in water. The activated carbon removes any impurities that might have passed through the process, and the mineral stones add other important minerals. This mineraliser introduces the important minerals in water, ensuring that it is rich in electrolytes and not harmful, preventing diseases like osteoporosis.
The other channel passes through a *Semipermeable Membrane* that uses Reverse Osmosis technology to separate salts, fluorides, minerals, bad odour etc. from the water.
These 2 channels are then combined using a *TDS controller* to ensure optimal taste and amount of minerals and no odour.

UV Filtration [3] The water is now free of all the unhealthy salts, fluorides, chlorides and other inorganic impurities. Most of the existing purifiers in the market stop at this step, but our prototype also makes sure to kill all bacteria and microorganisms. Water supply in urban areas by Municipal Corporations is usually free of them, but that's not true for rural areas. Our prototype uses a *UV light* to kill them, making them inactive and preventing serious diseases like diarrhoea.

Storage [4] We store the pure mineral rich water in a clay pot (*matka*) rather than plastic containers. Delhi's climate is very hot in summers, so we decided to use a clay pot for our prototype. Clay pots naturally keep the water cool, making it better for the people that can't afford a refrigerator.
As for the *waste water*, rather than wasting it by throwing it away, our prototype stores it in a separate container so that it can be used for purposes like car washing, watering plants or cleaning the house. Our solution saves water since there is scarcity in water supply in rural areas.

Cost Analysis For our prototype we bought the parts from local shops and manufacturers making it cheaper for us to source them.

Component	Cost
Carbon Filter	₹300
Semipermeable Membrane	₹250-450
Sediment Pre Filter	₹100
Remineralizer	₹300-500
Earthen Pot	₹250
TDS Controller	₹50-100
UV Filter	₹500
Taps + Pipes	₹100
Waste Water container	₹200
Total	**₹2050-2500**

On comparing the cost with existing purifiers in the market, we found ours to be up to 10x cheaper.

Feature	Our prototype (H2ALL)	Havells Digiplus	Kent RO Pride Plus	Kent Gold Plus Water Purifier
Remineralizer	✓	✓	✗	✗
UV Filter	✓	✓	✓	✗
Electric	✓	✓	✓	✗
Storage Type	Clay pot (matka)	Plastics	Plastics	Plastics
Price	**~₹2,500**	**₹26,699**	**₹16,400**	**₹3,250**

Cost comparison with other purifiers [6][7][8]

Verification:

We assembled this purifier and got it **tested** along with a tap water sample from *Delhi Water and General Test Laboratory Pvt. Ltd*., a laboratory certified by MCD Delhi on 9th January, 2023. The results (refer to enclosure 5) showed that our water was **fit for consumption**, had optimal taste and no odour, was free of bacteria, and had a TDS of 84 that is good for

drinking. It also had almost no amount of fluoride, chloride etc that can be harmful for health. This was in **stark comparison** to the tap water sample we got tested, which showed a TDS of 359, **disagreeable** odour and taste and high amount of fluoride and chlorides, and showed to be **unfit for consumption**. In the current prototype, the rate of output of purified water is 1 litre per 10 minutes.

Impact on Society

1. The most important wealth of a nation is its health. Access to safe drinking water can improve living standards, life expectancy and health index by reducing the disease burden.
2. Better quality of drinking water will ensure a better immune system and hence more productivity leading to economic growth.
3. The cost incurred for the treatment of a water borne disease is more than the cost used to invest in a good quality, cost-effective water purifier. Hence, it helps save money which can now be used for educational related purposes too.
4. A simple purification system helps reduce the time and energy expenditure necessary for water collection from external sources.
5. Water containing concentrate in a normal RO filter is wasted. However, using it for environmental purposes reduces wastage as in our proposed prototype.

Follow up Action

- We plan to patent our innovation which would include the assembly and components and commercialise it.
- We would use the funds to continue our research on making the most energy efficient and cost effective water purifier and trying out other ways of purifying, like replacing the filters with a cheaper alternative or experiment with silver etc. for purification.
- Mass production of our purifier will help to cut down its cost even more hence making it more affordable.
- We aim to align our product with government operated campaigns like *Make in India*, *Jal Jeevan Mission*, *Vocal for Local* and *Har Ghar Jal*.
- By marketing it, we aim to make our product a part of Corporate Social Responsibility or CSR of companies so that needy individuals can be provided with purifiers free of cost.
- Setup a larger version of our prototype in community areas to provide access to clean water to a large number of people.

Acknowledgements

We would like to express our sincere gratitude towards the **NCSC board** for providing us with a platform to display our scientific temper. We are extremely thankful to the Respected Principal, **Brother Joy Thomas**, of our esteemed institution for providing us with the opportunity to take part in this event. We could not have undertaken this journey without the constant guidance and support of our guide teacher **Ma'am Jyoti Khandelwal** throughout the course of this research. We extend our gratitude towards **Dr. Shekhar Sarabhai Sir**, who guided us and gave constructive feedback from time to time. A special thanks to **Delhi Water and General Test Laboratory Pvt. Ltd.** for the quantitative analysis done on our water samples. We would like to express our gratitude to the **Internet** for being a great source of legitimate statistics for research purposes as well conducting surveys and analysis. We would like to acknowledge all the individuals who were a big part of this project: our **family, friends** and **teachers** who motivated and encouraged us in every step. Lastly, we would be remiss in not mentioning all the individuals who were a part of our survey and experiments and helped our project become a success.

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Enclosures

Enclosure 1: Survey conducted on google forms

Survey on water supply

"pure water is the world's first and foremost medicine"

*Required

1. Which region of Delhi do you belong to?

Mark only one oval.

- ◯ North
- ◯ North East
- ◯ North West
- ◯ East
- ◯ West
- ◯ South
- ◯ South West
- ◯ South East
- ◯ NCR

2. Which of the following best describes your financial situation?

Mark only one oval.

- ◯ Upper Class
- ◯ Middle Class
- ◯ Lower Class

Survey

3. What is the source of drinking water available in your household? *

Mark only one oval.

- ◯ Tube well/hand pump
- ◯ Bottled water
- ◯ Public tap
- ◯ Piped water supply
- ◯ Other: _____

4. Are you aware of the sources from where the drinking water is being supplied to you?

Mark only one oval.

- ◯ Yes
- ◯ No

5.

Mark only one oval per row.

	1-3 hours	4-7 hours	8-13 hours	14-20 hours	20-24 hours
What is the frequency of drinking water supply in your household/ neighbourhood per day?	◯	◯	◯	◯	◯
How often would you ideally like to get water in a day?	◯	◯	◯	◯	◯

6. Is the frequency of water received sufficient for your needs?

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Maybe

7. Is the quantity of drinking water you receive on a daily basis adequate according to your daily needs?

Mark only one oval.

- ◯ Yes
- ◯ No

8. Does the drinking water received have any specific taste or smell?

Mark only one oval.

- ◯ Yes
- ◯ No
- ◯ Sometimes

9. On a scale of 1 to 10, how satisfied are you with the quality of drinking water you receive?

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Not satisfied at all	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Highly satisfied

Water treatment

10. Do you use any kind of water treatment/purifying method for filtering drinking water?

Mark only one oval.

- ◯ Yes
- ◯ No

11. Does your water purifying system break/stop working?

Mark only one oval.

- ◯ Very Often
- ◯ Sometimes
- ◯ Never

12. If yes, what kind of water treatment method do you use?

Mark only one oval.

- ◯ RO
- ◯ Electric purifier
- ◯ Non-electric purifier
- ◯ Boiling water
- ◯ Cloth filtration
- ◯ Other: _____

13. Which of the following features of an RO are you aware of?

Tick all that apply.

- ☐ It wastes 3/4 th of the water
- ☐ It enhances taste and odour of the water
- ☐ It removes all healthy and unhealthy salts from the water
- ☐ None of the above

14. How important do you consider spending money on clean drinking water?

Mark only one oval.

	1	2	3	4	5	
Unimportant	◯	◯	◯	◯	◯	Extremely Important

15. How efficient on a scale of 1 to 10 are the concerned authorities of your area in solving any issue related to water?

Mark only one oval.

	1	2	3	4	5	6	7	8	9	10	
Not efficient at all (problem is never solved)	◯	◯	◯	◯	◯	◯	◯	◯	◯	◯	Very efficient (problem is solve

16. In cases when water supply to your locality is paused for some time, are you informed about it shortly before?

Mark only one oval.

- ◯ At all times
- ◯ Mostly
- ◯ Sometimes
- ◯ Never

17. Have you in the recent past(3-4 years) suffered from any of the water borne illnesses?:

Tick all that apply.

- [ ] Cholera
- [ ] Jaundice
- [ ] Typhoid
- [ ] Dysentery
- [ ] Other: _____

Your views & opinions

18. To what extent, do you believe, does the government help in fulfilling the water needs of the country?

_____

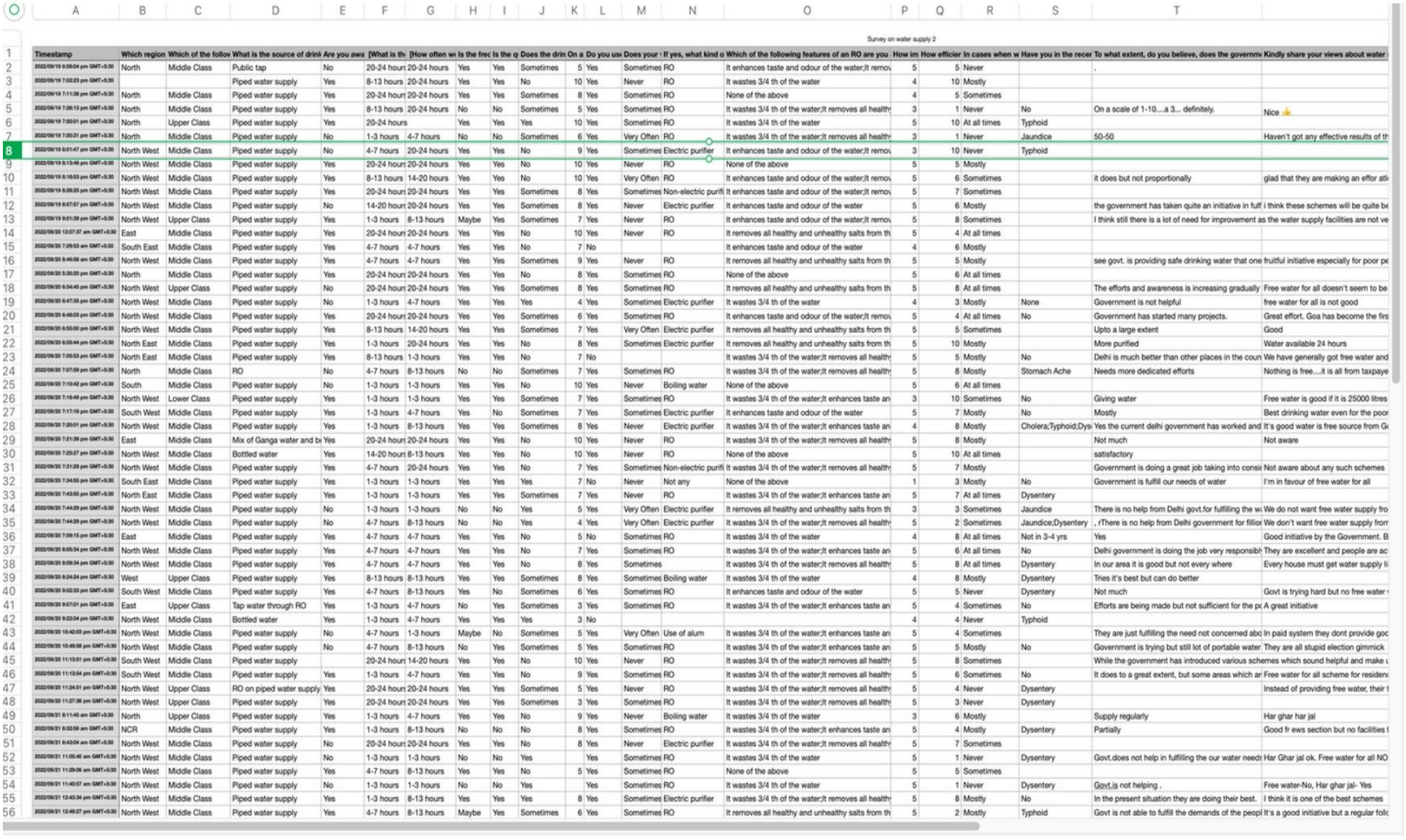
19. Kindly share your views about water supply schemes by the government (such as: 'free water for all', 'har Ghar jal' etc):

_____

20. How efficient and safe do you think ROs and water purifiers are?

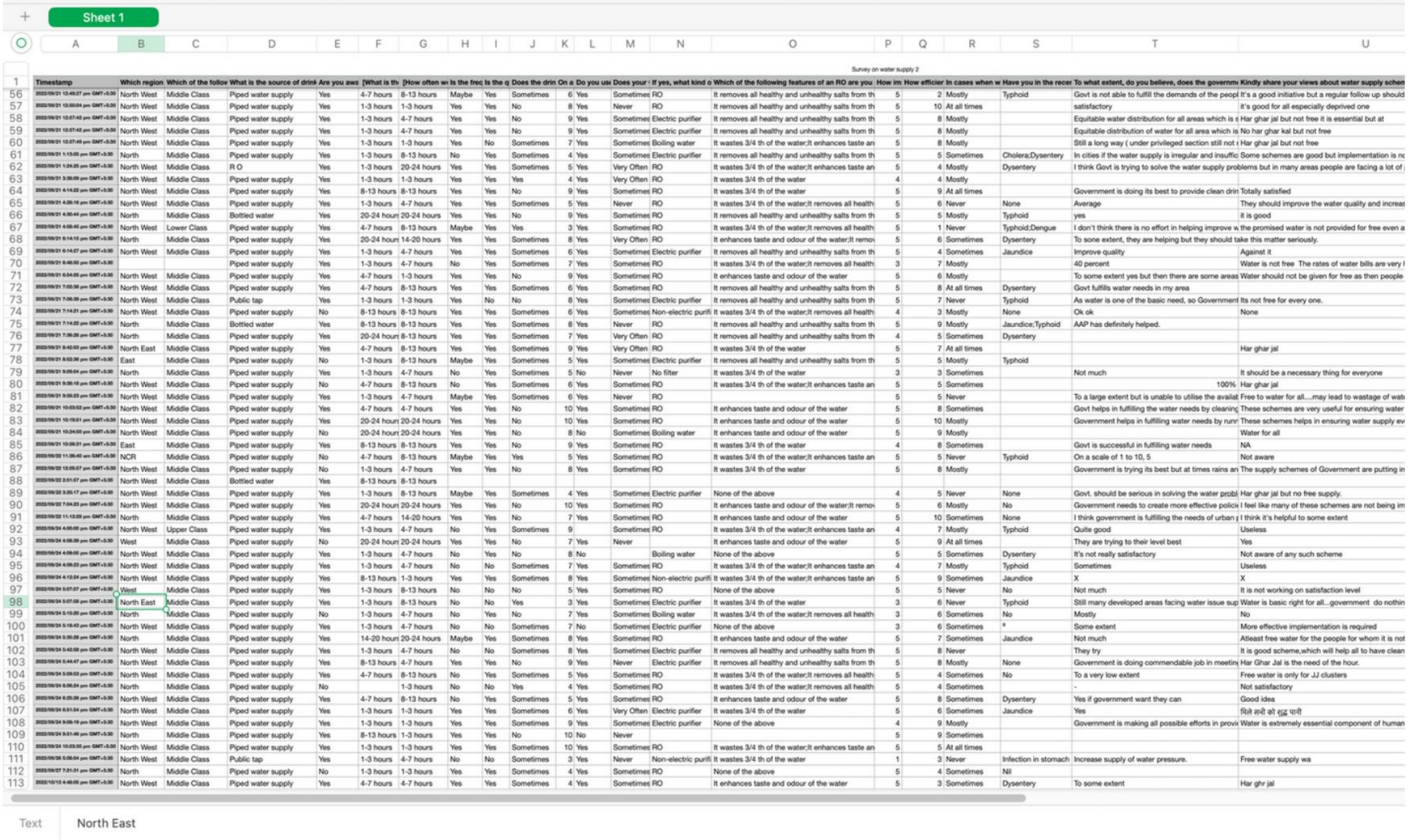
_____

Thank you so much for your response!



Survey on water supply 2

Timestamp	Which region	Which of the follow	What is the source of drink	Are you awa	[What is th	[How often w	Is the frec	Is the q	Does the drin	On a	Do you us	Does your	If yes, what kind o	Which of the following features of an RO are you	How im	How efficier	In cases when w	Have you in the recer	To what extent, do you believe, does the governm	Kindly share your views about water
2022/09/19 6:58:04 pm GMT+5:30	North	Middle Class	Public tap	No	20-24 hours	20-24 hours	Yes	Yes	Sometimes	5	Yes	Sometimes	RO	It enhances taste and odour of the water;It remov	5	5	Never		.	
2022/09/19 7:02:23 pm GMT+5:30			Piped water supply	Yes	8-13 hours	20-24 hours	Yes	Yes	No	10	Yes	Never	RO	It wastes 3/4 th of the water	4	10	Mostly			
2022/09/19 7:11:38 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	Sometimes	8	Yes	Sometimes	RO	None of the above	4	5	Sometimes			
2022/09/19 7:26:13 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	8-13 hours	20-24 hours	No	No	Sometimes	5	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	3	1	Never	No	On a scale of 1-10....a 3... definitely.	Nice 👍
2022/09/19 7:50:01 pm GMT+5:30	North	Upper Class	Piped water supply	Yes	20-24 hours		Yes	Yes	Yes	10	Yes	Sometimes	RO	It wastes 3/4 th of the water	5	10	At all times	Typhoid		
2022/09/19 7:50:31 pm GMT+5:30	North	Middle Class	Piped water supply	No	1-3 hours	4-7 hours	No	No	Sometimes	6	Yes	Very Often	RO	It wastes 3/4 th of the water;It removes all health	3	1	Never	Jaundice	50-50	Haven't got any effective results of th
2022/09/19 8:01:47 pm GMT+5:30	North West	Middle Class	Piped water supply	No	4-7 hours	20-24 hours	Yes	Yes	No	9	Yes	Sometimes	Electric purifier	It enhances taste and odour of the water;It remov	3	10	Never	Typhoid		
2022/09/19 8:13:48 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	No	10	Yes	Never	RO	None of the above	5	5	Mostly			
2022/09/19 8:18:53 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	8-13 hours	14-20 hours	Yes	Yes	No	10	Yes	Very Often	RO	It enhances taste and odour of the water;It remov	5	6	Sometimes		it does but not proportionally	glad that they are making an effor atl
2022/09/19 8:28:25 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	Sometimes	8	Yes	Sometimes	Non-electric purifi	It enhances taste and odour of the water;It remov	5	7	Sometimes			
2022/09/19 8:57:57 pm GMT+5:30	North West	Middle Class	Piped water supply	No	14-20 hours	20-24 hours	Yes	Yes	Sometimes	8	Yes	Never	Electric purifier	It enhances taste and odour of the water	5	6	Mostly		the government has taken quite an initiative in fulf	i think these schemes will be quite be
2022/09/19 9:01:39 pm GMT+5:30	North West	Upper Class	Piped water supply	Yes	1-3 hours	8-13 hours	Maybe	Yes	Sometimes	7	Yes	Never	RO	It enhances taste and odour of the water;It remov	5	8	Sometimes		I think still there is a lot of need for improvement as	the water supply facilities are not ve
2022/09/20 12:07:37 am GMT+5:30	East	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	No	10	Yes	Never	RO	It removes all healthy and unhealthy salts from th	5	4	At all times			
2022/09/20 7:29:53 am GMT+5:30	South East	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	No	7	No			It enhances taste and odour of the water	4	6	Mostly			
2022/09/20 8:46:58 am GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	Sometimes	9	Yes	Never	RO	It removes all healthy and unhealthy salts from th	5	5	Mostly		see govt. is providing safe drinking water that one	fruitful initiative especially for poor pe
2022/09/20 5:35:20 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	No	8	Yes	Sometimes	RO	None of the above	5	6	At all times			
2022/09/20 6:34:45 pm GMT+5:30	North West	Upper Class	Piped water supply	No	20-24 hours	20-24 hours	Yes	Yes	Sometimes	8	Yes	Sometimes	RO	It removes all healthy and unhealthy salts from th	5	8	At all times		The efforts and awareness is increasing gradually	Free water for all doesn't seem to be
2022/09/20 6:47:35 pm GMT+5:30	North West	Middle Class	Piped water supply	No	1-3 hours	4-7 hours	Yes	Yes	Yes	4	Yes	Sometimes	Electric purifier	It wastes 3/4 th of the water	4	3	Mostly	None	Government is not helpful	free water for all is not good
2022/09/20 6:48:03 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	Sometimes	6	Yes	Sometimes	RO	It enhances taste and odour of the water;It remov	5	4	At all times	No	Government has started many projects.	Great effort. Goa has become the firs
2022/09/20 6:55:00 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	8-13 hours	14-20 hours	Yes	Yes	Sometimes	7	Yes	Very Often	Electric purifier	It removes all healthy and unhealthy salts from th	5	5	Sometimes		Upto a large extent	Good
2022/09/20 6:55:44 pm GMT+5:30	North East	Middle Class	Piped water supply	Yes	1-3 hours	20-24 hours	Yes	Yes	No	8	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	10	Mostly		More purified	Water available 24 hours
2022/09/20 7:00:53 pm GMT+5:30	North East	Middle Class	Piped water supply	Yes	8-13 hours	1-3 hours	Yes	Yes	No	7	No			It wastes 3/4 th of the water;It removes all health	5	5	Mostly	No	Delhi is much better than other places in the coun	We have generally got free water and
2022/09/20 7:07:59 pm GMT+5:30	North	Middle Class	RO	No	4-7 hours	8-13 hours	No	No	Sometimes	7	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	5	8	Mostly	Stomach Ache	Needs more dedicated efforts	Nothing is free....it is all from taxpaye
2022/09/20 7:10:42 pm GMT+5:30	South	Middle Class	Piped water supply	No	1-3 hours	1-3 hours	Yes	Yes	No	10	Yes	Never	Boiling water	None of the above	5	6	At all times			
2022/09/20 7:16:48 pm GMT+5:30	North West	Lower Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Sometimes	7	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	3	10	Sometimes	No	Giving water	Free water is good if it is 25000 litres
2022/09/20 7:17:18 pm GMT+5:30	South West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	No	Sometimes	7	Yes	Sometimes	Electric purifier	It enhances taste and odour of the water	5	7	Mostly	No	Mostly	Best drinking water even for the poor
2022/09/20 7:20:01 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	Yes	Yes	Sometimes	8	Yes	Never	Electric purifier	It wastes 3/4 th of the water;It enhances taste an	4	8	Mostly	Cholera;Typhoid;Dys	Yes the current delhi government has worked and	It's good water is free source from G
2022/09/20 7:21:39 pm GMT+5:30	East	Middle Class	Mix of Ganga water and bi	Yes	20-24 hours	20-24 hours	Yes	Yes	No	10	Yes	Never	RO	It wastes 3/4 th of the water;It removes all health	5	8	Mostly		Not much	Not aware
2022/09/20 7:25:27 pm GMT+5:30	North West	Middle Class	Bottled water	Yes	14-20 hours	8-13 hours	Yes	Yes	No	10	Yes	Never	RO	None of the above	5	10	At all times		satisfactory	
2022/09/20 7:31:29 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	20-24 hours	Yes	Yes	No	7	Yes	Sometimes	Non-electric purifi	It wastes 3/4 th of the water;It removes all health	5	7	Mostly		Government is doing a great job taking into consi	Not aware about any such schemes
2022/09/20 7:34:55 pm GMT+5:30	South East	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Yes	7	No	Never	Not any	None of the above	1	3	Mostly	No	Government is fulfill our needs of water	I'm in favour of free water for all
2022/09/20 7:43:55 pm GMT+5:30	North East	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Sometimes	7	Yes	Never	RO	It wastes 3/4 th of the water;It enhances taste an	5	7	At all times	Dysentery		
2022/09/20 7:44:29 pm GMT+5:30	North West	Middle Class	Piped water supply	No	1-3 hours	1-3 hours	No	No	Yes	5	Yes	Very Often	Electric purifier	It removes all healthy and unhealthy salts from th	3	3	Sometimes	Jaundice	There is no help from Delhi govt.for fulfilling the w	We do not want free water supply fro
2022/09/20 7:44:29 pm GMT+5:30	North West	Middle Class	Piped water supply	No	4-7 hours	8-13 hours	No	No	Yes	4	Yes	Very Often	Electric purifier	It wastes 3/4 th of the water;It removes all health	5	2	Sometimes	Jaundice;Dysentery	, rThere is no help from Delhi government for fillio	We don't want free water supply from
2022/09/20 7:59:15 pm GMT+5:30	East	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	No	5	No	Sometimes	RO	It wastes 3/4 th of the water	4	8	At all times	Not in 3-4 yrs	Yes	Good initiative by the Government. B
2022/09/20 8:05:34 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	No	7	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	6	At all times	No	Delhi government is doing the job very responsibl	They are excellent and people are ac
2022/09/20 8:09:34 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	No	8	Yes	Sometimes		It wastes 3/4 th of the water;It removes all health	5	8	At all times	Dysentery	In our area it is good but not every where	Every house must get water supply li
2022/09/20 8:24:24 pm GMT+5:30	West	Upper Class	Piped water supply	Yes	8-13 hours	8-13 hours	Yes	Yes	Sometimes	8	Yes	Sometimes	Boiling water	It wastes 3/4 th of the water	4	8	Mostly	Dysentery	Tries it's best but can do better	
2022/09/20 9:02:33 pm GMT+5:30	South West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	Yes	No	Sometimes	6	Yes	Sometimes	RO	It enhances taste and odour of the water	5	5	Never	Dysentery	Not much	Govt is trying hard but no free water
2022/09/20 9:07:01 pm GMT+5:30	East	Upper Class	Tap water through RO	Yes	1-3 hours	4-7 hours	No	Yes	Sometimes	3	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	4	Sometimes	No	Efforts are being made but not sufficient for the pe	A great initiative
2022/09/20 9:22:04 pm GMT+5:30	North West	Middle Class	Bottled water	Yes	1-3 hours	4-7 hours	Yes	Yes	Yes	3	No				4	4	Never	Typhoid		
2022/09/20 10:42:03 pm GMT+5:30	North West	Middle Class	Piped water supply	No	4-7 hours	1-3 hours	Maybe	No	Sometimes	5	Yes	Very Often	Use of alum	It wastes 3/4 th of the water;It enhances taste an	5	4	Sometimes		They are just fulfilling the need not concerned abo	In paid system they dont provide goo
2022/09/20 10:49:58 pm GMT+5:30	North West	Middle Class	Piped water supply	No	4-7 hours	8-13 hours	No	Yes	Sometimes	5	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	5	Mostly	No	Government is trying but still lot of portable water	They are all stupid election gimmick
2022/09/20 11:13:01 pm GMT+5:30	South West	Middle Class	Piped water supply		20-24 hours	14-20 hours	Yes	Yes	No	10	Yes	Never	RO	It wastes 3/4 th of the water;It removes all health	5	8	Sometimes		While the government has introduced various schemes	which sound helpful and make u
2022/09/20 11:13:54 pm GMT+5:30	South West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	Yes	No	9	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	5	6	Sometimes	No	It does to a great extent, but some areas which ar	Free water for all scheme for residen
2022/09/20 11:24:51 pm GMT+5:30	North West	Upper Class	RO on piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	Sometimes	5	Yes	Never	RO	It wastes 3/4 th of the water;It removes all health	5	4	Never	Dysentery		Instead of providing free water, their
2022/09/20 11:27:36 pm GMT+5:30	North West	Upper Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	Sometimes	3	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	5	3	Never	Dysentery		
2022/09/21 8:11:45 am GMT+5:30	North	Upper Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	Yes	No	9	Yes	Never	Boiling water	It wastes 3/4 th of the water	3	6	Mostly		Supply regularly	Har ghar har jal
2022/09/21 8:32:58 am GMT+5:30	NCR	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	No	No	No	8	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	4	Mostly	Dysentery	Partially	Good fr ews section but no facilities
2022/09/21 8:43:04 am GMT+5:30	North West	Middle Class	Piped water supply	No	20-24 hours	20-24 hours	Yes	Yes	No	8	Yes	Never	Electric purifier	It wastes 3/4 th of the water;It removes all health	5	7	Sometimes			
2022/09/21 11:05:40 am GMT+5:30	North West	Middle Class	Piped water supply	No	1-3 hours	1-3 hours	No	No	Yes		Yes	Sometimes	RO	It wastes 3/4 th of the water	5	1	Never	Dysentery	Govt.does not help in fulfilling the our water needs	Har Ghar jal ok. Free water for all NO
2022/09/21 11:29:06 am GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	Yes	Yes	No	5	Yes	Sometimes	RO	None of the above	5	5	Sometimes			
2022/09/21 11:40:57 am GMT+5:30	North West	Middle Class	Piped water supply	No	1-3 hours	1-3 hours	No	No	Yes		Yes	Sometimes	RO	It wastes 3/4 th of the water	5	1	Never	Dysentery	Govt.is not helping .	Free water-No, Har ghar jal- Yes
2022/09/21 12:43:34 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	Yes	Yes	Yes	8	Yes	Sometimes	Electric purifier	It wastes 3/4 th of the water;It removes all health	5	8	Mostly	No	In the present situation they are doing their best.	I think it is one of the best schemes
2022/09/21 12:49:27 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	Maybe	Yes	Sometimes	6	Yes	Sometimes	RO	It removes all healthy and unhealthy salts from th	5	2	Mostly	Typhoid	Govt is not able to fulfill the demands of the peopl	It's a good initiative but a regular follo



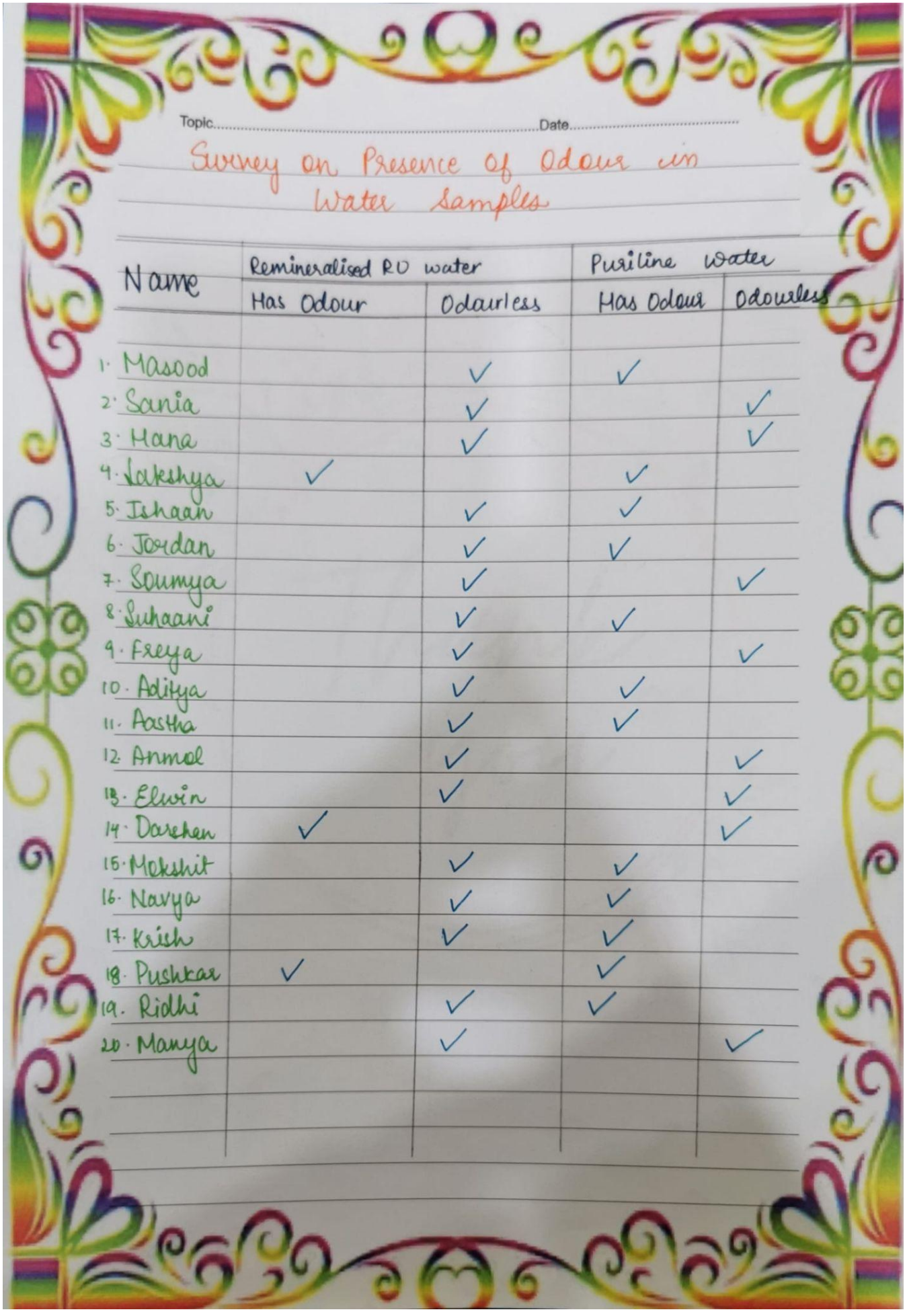
Sheet 1

Survey on water supply 2

	Timestamp	Which region	Which of the follow	What is the source of drink	Are you awa	[What is th	[How often w	Is the freq	Is the q	Does the drin	On a	Do you use	Does your	If yes, what kind o	Which of the following features of an RO are you	How im	How efficier	In cases when w	Have you in the recer	To what extent, do you believe, does the governm	Kindly share your views about water supply schem
56	2022/09/21 12:49:27 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	Maybe	Yes	Sometimes	6	Yes	Sometimes	RO	It removes all healthy and unhealthy salts from th	5	2	Mostly	Typhoid	Govt is not able to fulfill the demands of the peopl	It's a good initiative but a regular follow up should
57	2022/09/21 12:50:04 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	No	8	Yes	Never	RO	It removes all healthy and unhealthy salts from th	5	10	At all times		satisfactory	it's good for all especially deprived one
58	2022/09/21 12:57:42 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	Yes	No	9	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	8	Mostly		Equitable water distribution for all areas which is s	Har ghar jal but not free it is essential but at
59	2022/09/21 12:57:42 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	Yes	No	9	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	8	Mostly		Equitable distribution of water for all area which is	No har ghar kal but not free
60	2022/09/21 12:57:49 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	No	Sometimes	7	Yes	Sometimes	Boiling water	It wastes 3/4 th of the water;It enhances taste an	5	8	Mostly		Still a long way (under privileged section still not a	Har ghar jal but not free
61	2022/09/21 1:13:05 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	No	Yes	Sometimes	4	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	5	Sometimes	Cholera;Dysentery	In cities if the water supply is irregular and insuffic	Some schemes are good but implementation is no
62	2022/09/21 1:24:25 pm GMT+5:30	North West	Middle Class	R O	Yes	1-3 hours	20-24 hours	Yes	Yes	Sometimes	5	Yes	Very Often	RO	It wastes 3/4 th of the water;It enhances taste an	5	4	Mostly	Dysentery	I think Govt is trying to solve the water supply problems but in many areas people are facing a lot of	
63	2022/09/21 3:38:09 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Yes	4	Yes	Very Often	RO	It wastes 3/4 th of the water	4	4	Mostly			
64	2022/09/21 6:14:22 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	8-13 hours	8-13 hours	Yes	Yes	No	9	Yes	Sometimes	RO	It wastes 3/4 th of the water	5	9	At all times		Government is doing its best to provide clean drin	Totally satisfied
65	2022/09/21 6:26:16 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	Yes	Sometimes	5	Yes	Never	RO	It wastes 3/4 th of the water;It removes all health	5	6	Never	None	Average	They should improve the water quality and increas
66	2022/09/21 4:30:44 pm GMT+5:30	North	Middle Class	Bottled water	Yes	20-24 hours	20-24 hours	Yes	Yes	No	9	Yes	Sometimes	RO	It removes all healthy and unhealthy salts from th	5	5	Mostly	Typhoid	yes	it is good
67	2022/09/21 4:58:45 pm GMT+5:30	North West	Lower Class	Piped water supply	Yes	4-7 hours	8-13 hours	Maybe	Yes	Yes	3	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	5	1	Never	Typhoid;Dengue	I don't think there is no effort in helping improve w	the promised water is not provided for free even a
68	2022/09/21 5:14:15 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	20-24 hours	14-20 hours	Yes	Yes	Sometimes	8	Yes	Very Often	RO	It enhances taste and odour of the water;It remov	5	6	Sometimes	Dysentery	To sone extent, they are helping but they should take	this matter seriously.
69	2022/09/21 5:14:27 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Yes	Yes	Sometimes	6	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	4	Sometimes	Jaundice	Improve quality	Against it
70	2022/09/21 6:48:50 pm GMT+5:30			Piped water supply	Yes	1-3 hours	4-7 hours	No	Yes	Sometimes	7	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	3	7	Mostly		40 percent	Water is not free The rates of water bills are very l
71	2022/09/21 6:54:05 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	1-3 hours	Yes	Yes	No	9	Yes	Sometimes	RO	It enhances taste and odour of the water	5	6	Mostly		To some extent yes but then there are some areas	Water should not be given for free as then people
72	2022/09/21 7:03:38 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	Yes	Yes	Sometimes	6	Yes	Sometimes	RO	It removes all healthy and unhealthy salts from th	5	8	At all times	Dysentery	Govt fulfills water needs in my area	
73	2022/09/21 7:06:39 pm GMT+5:30	North West	Middle Class	Public tap	Yes	1-3 hours	1-3 hours	Yes	No	No	8	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	7	Never	Typhoid	As water is one of the basic need, so Government	Its not free for every one.
74	2022/09/21 7:14:21 pm GMT+5:30	North West	Middle Class	Piped water supply	No	8-13 hours	8-13 hours	Yes	Yes	Sometimes	6	Yes	Sometimes	Non-electric purifi	It wastes 3/4 th of the water;It removes all health	4	3	Mostly	None	Ok ok	None
75	2022/09/21 7:14:22 pm GMT+5:30	North	Middle Class	Bottled water	Yes	8-13 hours	8-13 hours	Yes	Yes	Sometimes	8	Yes	Never	RO	It removes all healthy and unhealthy salts from th	5	9	Mostly	Jaundice;Typhoid	AAP has definitely helped.	
76	2022/09/21 7:36:26 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	20-24 hours	8-13 hours	Yes	Yes	Sometimes	7	Yes	Very Often	RO	It removes all healthy and unhealthy salts from th	4	5	Sometimes	Dysentery		
77	2022/09/21 8:42:03 pm GMT+5:30	North East	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	Yes	Yes	Sometimes	9	Yes	Very Often	RO	It wastes 3/4 th of the water	5	7	At all times			Har ghar jal
78	2022/09/21 8:52:36 pm GMT+5:30	East	Middle Class	Piped water supply	No	1-3 hours	8-13 hours	Maybe	Yes	Sometimes	5	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	5	Mostly	Typhoid		
79	2022/09/21 9:09:04 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	No	Yes	Sometimes	5	No	Never	No filter	It wastes 3/4 th of the water	3	3	Sometimes		Not much	It should be a necessary thing for everyone
80	2022/09/21 9:38:16 pm GMT+5:30	North West	Middle Class	Piped water supply	No	4-7 hours	8-13 hours	No	Yes	Sometimes	6	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	5	Sometimes		100%	Har ghar jal
81	2022/09/21 9:56:23 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	Maybe	Yes	Sometimes	6	Yes	Never	RO		5	5	Never		To a large extent but is unable to utilise the availat	Free to water for all.....may lead to wastage of wat
82	2022/09/21 10:03:52 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	No	10	Yes	Sometimes	RO	It enhances taste and odour of the water	5	8	Sometimes		Govt helps in fulfilling the water needs by cleaning	These schemes are very useful for ensuring water
83	2022/09/21 10:19:51 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	No	10	Yes	Sometimes	RO	It enhances taste and odour of the water	5	10	Mostly		Government helps in fulfilling water needs by runr	These schemes helps in ensuring water supply ev
84	2022/09/21 10:24:50 pm GMT+5:30	North West	Middle Class	Piped water supply	No	20-24 hours	20-24 hours	Yes	Yes	No	8	No	Sometimes	Boiling water	It enhances taste and odour of the water	5	9	Mostly			Water for all
85	2022/09/21 10:56:31 pm GMT+5:30	East	Middle Class	Piped water supply	Yes	8-13 hours	8-13 hours	Yes	Yes	No	9	Yes	Sometimes	RO	It wastes 3/4 th of the water	4	8	Sometimes		Govt is successful in fulfilling water needs	NA
86	2022/09/22 11:36:40 am GMT+5:30	NCR	Middle Class	Piped water supply	No	4-7 hours	8-13 hours	Maybe	Yes	Yes	5	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	5	Never	Typhoid	On a scale of 1 to 10, 5	Not aware
87	2022/09/22 12:05:57 pm GMT+5:30	North West	Middle Class	Piped water supply	No	1-3 hours	4-7 hours	Yes	Yes	No	8	Yes	Sometimes	RO	It wastes 3/4 th of the water	5	8	Mostly		Government is trying its best but at times rains an	The supply schemes of Government are putting in
88	2022/09/22 2:51:57 pm GMT+5:30	North West	Middle Class	Bottled water	Yes	8-13 hours	8-13 hours														
89	2022/09/22 3:25:17 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	Maybe	Yes	Sometimes	4	Yes	Sometimes	Electric purifier	None of the above	4	5	Never	None	Govt. should be serious in solving the water probl	Har ghar jal but no free supply.
90	2022/09/22 7:04:23 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	20-24 hours	20-24 hours	Yes	Yes	No	10	Yes	Sometimes	RO	It enhances taste and odour of the water;It remov	5	6	Mostly	No	Government needs to create more effective policie	I feel like many of these schemes are not being im
91	2022/09/22 11:12:28 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	4-7 hours	14-20 hours	Yes	Yes	No	7	Yes	Sometimes	RO	It enhances taste and odour of the water	5	10	Sometimes	None	I think government is fulfilling the needs of urban a	I think it's helpful to some extent
92	2022/09/24 4:00:00 pm GMT+5:30	North West	Upper Class	Piped water supply	Yes	1-3 hours	4-7 hours	No	Yes	Sometimes	9		Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	4	7	Mostly	Typhoid	Quite good	Useless
93	2022/09/24 4:06:30 pm GMT+5:30	West	Middle Class	Piped water supply	No	20-24 hours	20-24 hours	Yes	Yes	No	7	Yes	Never		It enhances taste and odour of the water	5	9	At all times		They are trying to their level best	Yes
94	2022/09/24 4:09:05 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	No	Yes	No	8	No		Boiling water	None of the above	5	5	Sometimes	Dysentery	It's not really satisfactory	Not aware of any such scheme
95	2022/09/24 4:09:23 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	No	No	Sometimes	7	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	4	7	Mostly	Typhoid	Sometimes	Useless
96	2022/09/24 4:12:24 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	8-13 hours	1-3 hours	Yes	Yes	Sometimes	8	Yes	Sometimes	Non-electric purifi	It wastes 3/4 th of the water;It enhances taste an	5	9	Sometimes	Jaundice	X	X
97	2022/09/24 5:07:07 pm GMT+5:30	West	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	No	No	No	5	Yes	Sometimes	RO	None of the above	5	5	Never	No	Not much	It is not working on satisfaction level
98	2022/09/24 5:07:58 pm GMT+5:30	North East	Middle Class	Piped water supply	Yes	1-3 hours	8-13 hours	No	No	Yes	3	Yes	Sometimes	Electric purifier	It wastes 3/4 th of the water	3	6	Never	Typhoid	Still many developed areas facing water issue sup	Water is basic right for all...government do nothin
99	2022/09/24 5:15:20 pm GMT+5:30	North	Middle Class	Piped water supply	No	1-3 hours	4-7 hours	No	Yes	No	7	Yes	Sometimes	Boiling water	It wastes 3/4 th of the water;It removes all health	3	6	Sometimes	No	Mostly	No
100	2022/09/24 5:18:43 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	No	No	Sometimes	7	No	Sometimes	Electric purifier	None of the above	3	6	Sometimes	ª	Some extent	More effective implementation is required
101	2022/09/24 5:35:28 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	14-20 hours	20-24 hours	Maybe	Yes	Sometimes	8	Yes	Sometimes	RO	It enhances taste and odour of the water	5	7	Sometimes	Jaundice	Not much	Atleast free water for the people for whom it is not
102	2022/09/24 5:42:58 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	4-7 hours	No	No	Sometimes	8	Yes	Sometimes	Electric purifier	It removes all healthy and unhealthy salts from th	5	8	Never		They try	It is good scheme,which will help all to have clean
103	2022/09/24 5:44:47 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	8-13 hours	4-7 hours	Yes	Yes	No	9	Yes	Never	Electric purifier	It removes all healthy and unhealthy salts from th	5	8	Mostly	None	Government is doing commendable job in meetin	Har Ghar Jal is the need of the hour.
104	2022/09/24 5:59:53 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	No	Yes	Sometimes	5	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	5	4	Sometimes	No	To a very low extent	Free water is only for JJ clusters
105	2022/09/24 6:06:24 pm GMT+5:30	North	Middle Class	Piped water supply	No		1-3 hours	No	No	Yes	4	Yes	Sometimes	RO	It wastes 3/4 th of the water;It removes all health	5	4	Sometimes		-	Not satisfactory
106	2022/09/24 6:25:26 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	8-13 hours	No	Yes	Sometimes	5	Yes	Sometimes	RO	It enhances taste and odour of the water	5	8	Sometimes	Dysentery	Yes if government want they can	Good idea
107	2022/09/24 6:51:54 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Sometimes	6	Yes	Very Often	Electric purifier	It wastes 3/4 th of the water	5	6	Sometimes	Jaundice	Yes	मिले सभी को शुद्ध पानी
108	2022/09/24 9:08:19 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Sometimes	9	Yes	Sometimes	Electric purifier	None of the above	4	9	Mostly		Government is making all possible efforts in provi	Water is extremely essential component of human
109	2022/09/24 9:51:46 pm GMT+5:30	North	Middle Class	Piped water supply	Yes	8-13 hours	1-3 hours	Yes	Yes	No	10	No	Never			5	9	Sometimes			
110	2022/09/24 10:03:55 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	1-3 hours	1-3 hours	Yes	Yes	Sometimes	10	Yes	Sometimes	RO	It wastes 3/4 th of the water;It enhances taste an	5	5	At all times			
111	2022/09/26 5:06:04 pm GMT+5:30	North West	Middle Class	Public tap	Yes	1-3 hours	4-7 hours	No	No	Sometimes	3	Yes	Never	Non-electric purifi	It wastes 3/4 th of the water	1	3	Never	Infection in stomach	Increase supply of water pressure.	Free water supply wa
112	2022/09/27 7:21:31 pm GMT+5:30	North	Middle Class	Piped water supply	No	1-3 hours	1-3 hours	Yes	Yes	Sometimes	4	Yes	Sometimes	RO	None of the above	5	4	Sometimes	Nil		
113	2022/10/13 4:48:05 pm GMT+5:30	North West	Middle Class	Piped water supply	Yes	4-7 hours	4-7 hours	Yes	Yes	Sometimes	4	Yes	Sometimes	RO	It enhances taste and odour of the water	5	3	Sometimes	Dysentery	To some extent	Har ghr jal

Text | North East

Enclosure 3: Odour survey



Topic..... Date.....

Survey on Presence of Odour in Water Samples

Name	Remineralised RO water		Puriline Water	
	Has Odour	Odourless	Has Odour	Odourless
1. Masood		✓	✓	
2. Sania		✓		✓
3. Hana		✓		✓
4. Lakshya	✓		✓	
5. Ishaan		✓	✓	
6. Jordan		✓	✓	
7. Soumya		✓		✓
8. Suhaani		✓	✓	
9. Freya		✓		✓
10. Aditya		✓	✓	
11. Aastha		✓	✓	
12. Anmol		✓		✓
13. Elwin		✓		✓
14. Darshan	✓			✓
15. Mokshit		✓	✓	
16. Navya		✓	✓	
17. Krish		✓	✓	
18. Pushkar	✓		✓	
19. Ridhi		✓	✓	
20. Manya		✓		✓

Enclosure 4: Experimentation report

EXPERIMENTS

We carried out several experiments on:

① Tap water
② RO water
③ School's Water (From filter)

in the chemistry lab of our school to check the quality of water.

(A) pH Paper Test

Aim: To determine the pH of the given water samples.

Procedure: Keep three strips of pH paper on a tile. Put some drops of water sample on the strips and observe their colour.

Observation:

1. Tap water turned pH paper light green
2. RO water did not change colour of pH paper (yellow)
3. Water from school filter turned pH paper dark green.

Conclusion:

1. Tap water mildly alkaline
2. RO water is neutral.
3. Water from school filter is very alkaline.

(B) Presence of Organic Impurities

Aim: To check whether given water samples consist organic impurities.

Procedure: Add 4 drops of potassium permanganate to small glass of water sample and shake well.
If sample is pure it will appear purple or red.
If organic impurities are present, it will turn yellow or pale.

Observation: All three water samples appear purple.

Conclusion: No organic impurities were present.

(C) Presence of Zinc or Iron

Aim: To check whether given water samples contain zinc or iron

Procedure: Add few drops of ferro-cyanide of potassium to a small test tube of water & stir it well. If the colour of water turns green then zinc is present & if colour of water turns blue then iron is present.

Observation:

1. Tap water turned green
2. RO water turned mildly green (almost transparent).
3. School water filter's sample turned green

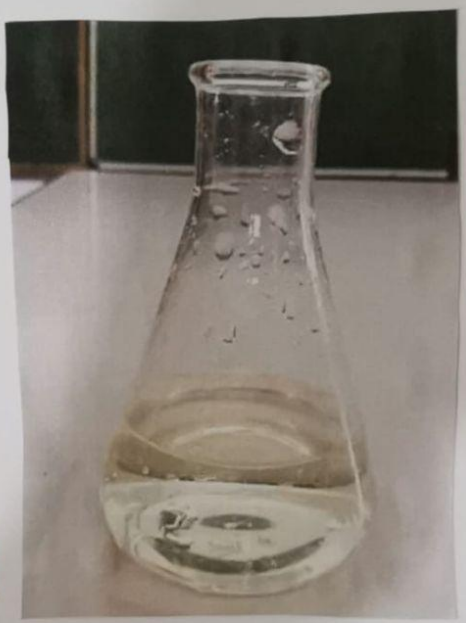
Conclusion:

Tap water contains zinc contaminant. Filter water also contains zinc. RO water contains zinc in very less amount.

pH paper test

Test for presence of Organic Impurities

- Samples appear purple



Test for Presence of Zinc or Iron

(D) Presence of Carbonic Acid

Aim: To check whether given water samples contains carbonic acid.

Procedure: Add lime in a sample of water and shake it well until it turns milky. If this turbidity will disappear on the addition of HCl, then it is an indication of presence of carbonic acid.

Observation: In All three water samples, turbidity disappeared on addition of HCl.

Conclusion: All three water samples contain some amount of carbonic acid.

(E) Hardness of Water

Aim: To determine the hardness of given water samples

Procedure: ① Collect about 75 cm^3 of soap solution in a small beaker. Set up a burette and using a small funnel fill it with soap solution.

② Use a measuring cylinder to measure out 10 cm^3 of one of the samples of water from the following into a conical flask:

(a) Tap water (b) RO water (c) Filter water sample

③ Read the burette. Add 1 cm^3 of soap solution to the water in conical flask. Stopper the flask and shake it. If lather appears that lasts for 30 seconds, stop & read the burette. Repeat the process until a lather forms that lasts for 30 seconds. Read the burette.

Observation:

(a) Tap Water:

Reading of burette = 3 cm^3

Hardness $= \frac{0.003}{10} \times 10^6 = 300$ ppm

(b) RO water:

Reading of burette = 1 cm^3

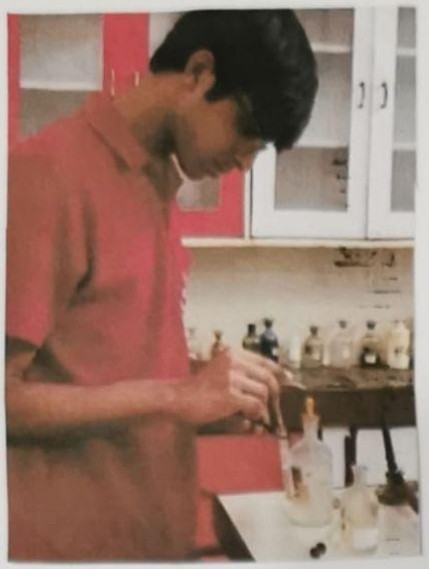
Hardness $= \frac{0.001}{10} \times 10^6 = 100$ ppm

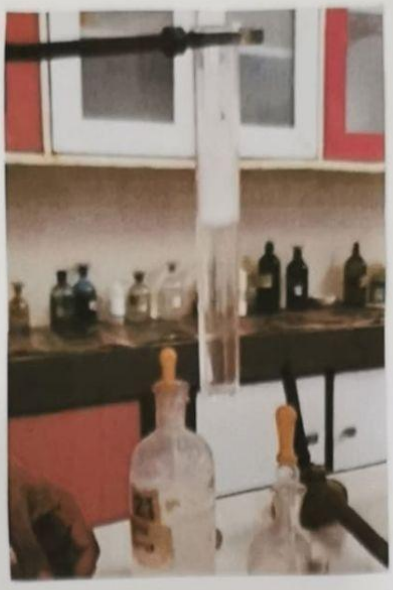
(c) Filter water sample:

Reading of burette = 3 cm^3

Hardness $= \frac{0.003}{10} \times 10^6 = 300$ ppm

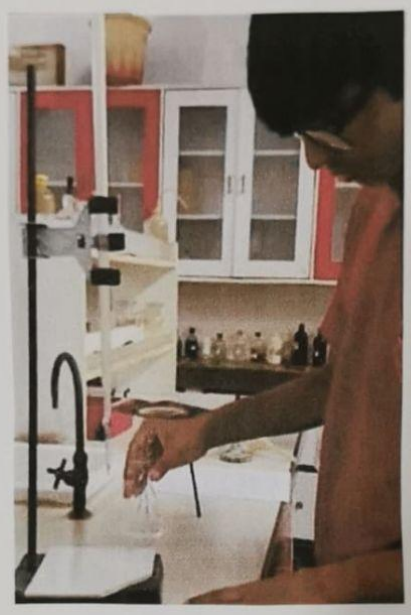
Conclusion: The RO water has appropriate hardness for drinking whereas tap water and filter water sample are very hard which makes them unfit for drinking.

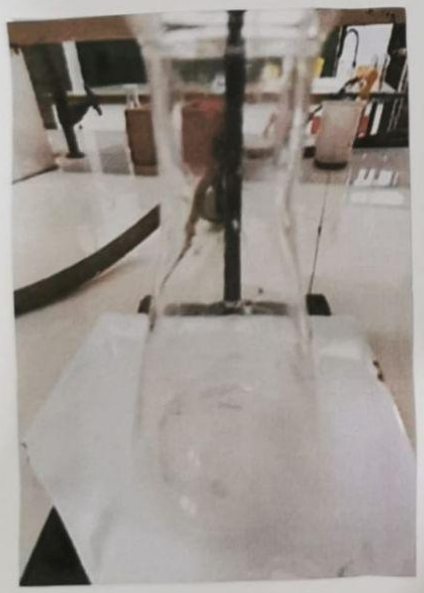




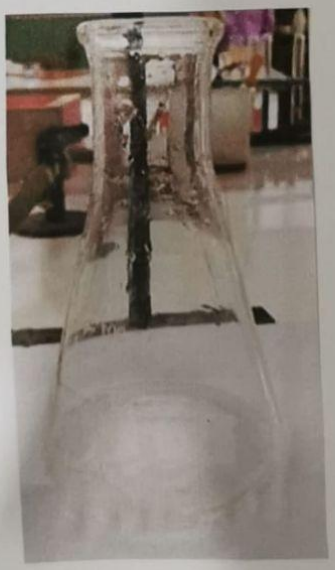
Test for Presence of Carbonic Acid

Test for Hardness of Water

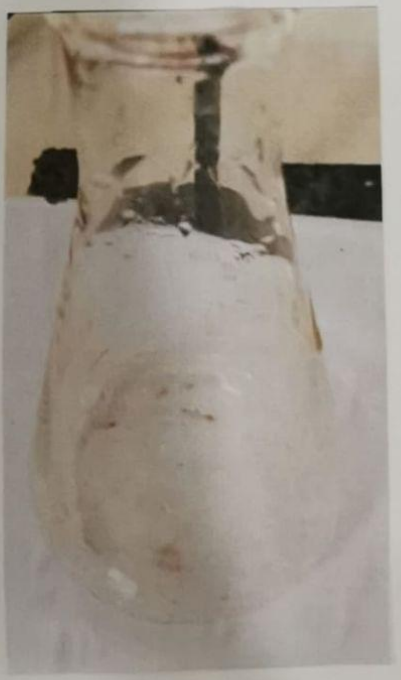




School filter water



RO water



Tap water

Enclosure 5: Laboratory report of water quality of prototype

302 B - 11
Commercial Complax, Ranjeet Nagar, New Delhi- 110008
Phone 011 - 25700168, 9099554242 , 9899554242
email : dwtl@watersupermart.com • www.delhiwatertestlab.com

Delhi WATER & GENERAL TEST LAB (P) Ltd.

AN ISO 9001 : 2008 COMPANY

analysis report

TEST CERTIFICATE

Test certificate No: DWGTL/22-23/151 CB

Party's name: Project - H2 All, Montfort School
Ashok Vihar, Delhi-110052
C/O Mokshit Jain & Navya Gupta

Issue Date: 13/01/2023
Ref. No.: Nil
Protocol Used: IS:10500-2012

Date of Sample Receipt: 09/01/23
Sample Collected by: Party

Types of water: R.O. Prototype Water

Lab code: DWGTL/22-23/151 CB
Testing Duration : 09/01/23 TO 12/01/23

	S.N	Parameters	Units	Test Results	Requirements	Test method Used
Physical analysis	1.	Color	-----	< 1	5	IS:3025 Pt-4-2002
	2.	Odor	----	Agreeable	Agreeable	IS:3025 Pt-5-2012
	3.	Taste	----	Agreeable	Agreeable	IS:3025 Pt-8-2006
	4.	Turbidity, NTU	NTU	0.2	1	IS:3025 Pt-10-2006
	5.	pH	-----	7.12	6.5-8.5	IS:3025 Pt-11-2002
Chemical analysis	6.	Total Dissolved Solid	mg/l	84	500	IS:3025 Pt-16-2003
	7.	Total Iron as Fe	mg/l	0.03	0.3	IS:3025 Pt-53-2009
	8.	Total Hardness	mg/l	24	200	IS:3025 Pt-21-2009
	9.	Chlorides as Cl	mg/l	18.3	250	IS:3025 Pt-32-2002
	10.	Residual Free chlorine	mg/l	Nil	0.2	IS:3025-Pt.-26-2003
	11	Sulphate as SO_4	mg/l	7.1	200	IS:3025pt-24-2009
	12	Fluorides as F-	mg/l	0.08	1.0	IS:3025-Pt.-60-2003
Microbio-logical test	13	Coli form	MPN/100ml	Absent	Absent	IS:1622,1981(2003)
	14.	E.Coli	MPN/100ml	Absent	Absent	IS:1622,1981(2003)

REMARKS: : With respect to Physical, Chemical & Bacteriological Tests, water confirms to IS: 10500-2012. Therefore it can be considered **fit** for drinking purpose.

G Singh
Checked by Sr. Chemist

Delhi Water & Gen. Test Lab (P) Ltd. New Delhi

Authorized signatory

WE UNDERTAKE TESTING OF : WATER * AIR * EFFLUENTS * MATERIALS

Approved by the Municipal Coporation of Delhi (Health Deptt)

Enclosure 6: Laboratory report of tap water sample

302 B - 11
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email : dwtl@watersupermart.com • www.delhiwatertestlab.com

Delhi WATER & GENERAL TEST LAB (P) Ltd.

AN ISO 9001 : 2008 COMPANY

analysis report

TEST CERTIFICATE

Test certificate No: DWGTL/22-23/150 CB
Issue Date: 13/01/2023

Party's name: Project - H2 All, Montfort School
Ashok Vihar, Delhi-110052
C/O Mokshit Jain & Navya Gupta
Ref. No.: Nil
Protocol Used: IS:10500-2012

Date of Sample Receipt: 09/01/23
Types of water: Ta p Water
Lab code: DWGTL/22-23/150 CB
Sample Collected by: Party
Testing Duration : 09/01/23 TO 12/01/23

	S.N	Parameters	Units	Test Results	Requirements	Test method Used
Physical analysis	1.	Color	-----	< 3	5	IS:3025 Pt-4-2002
	2.	Odor	----	Disagreeable	Agreeable	IS:3025 Pt-5-2012
	3.	Taste	----	Disagreeable	Agreeable	IS:3025 Pt-8-2006
	4.	Turbidity, NTU	NTU	0.8	1	IS:3025 Pt-10-2006
	5.	pH	-----	7.64	6.5-8.5	IS:3025 Pt-11-2002
	6.	Total Dissolved Solid	mg/l	359	500	IS:3025 Pt-16-2003
Chemical analysis	7.	Total Iron as Fe	mg/l	0.21	0.3	IS:3025 Pt-53-2009
	8.	Total Hardness	mg/l	115	200	IS:3025 Pt-21-2009
	9.	Chlorides as Cl	mg/l	89.6	250	IS:3025 Pt-32-2002
	10.	Residual Free chlorine	mg/l	0.03	0.2	IS:3025-Pt.-26-2003
	11	Sulphate as SO_4	mg/l	31.7	200	IS:3025pt-24-2009
	12	Fluorides as F-	mg/l	0.49	1.0	IS:3025-Pt.-60-2003
Microbio-logical test	13	Coli form	MPN/100ml	Absent	Absent	IS:1622,1981(2003)
	14.	E.Coli	MPN/100ml	Absent	Absent	IS:1622,1981(2003)

REMARKS: : With respect to Physical, Chemical & Bacteriological Tests, water doesn't confirm to IS: 10500-2012. Therefore it can be considered **unfit** for drinking purpose.

Checked by Sr. Chemist

Delhi Water & Gen. Test Lab (P) Ltd. New Delhi

Authorized signatory

WE UNDERTAKE TESTING OF : WATER * AIR * EFFLUENTS * MATERIALS

Approved by the Municipal Coporation of Delhi (Health Deptt)