Water quality monitoring system

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APPROVAL

This Project/internship titled **"Water quality monitoring system"**, submitted by Rashedul Islam, ID No: 181-15-1879; Abu Abdullah Nisat, ID No: 181-15-1878; MD. Atikur Rahman, ID No: 181-15-2024 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 19.0.09.2021

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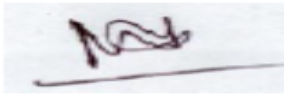

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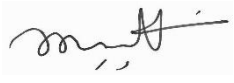

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We hereby declare that this research has been done by us under the supervision of **MD. Reduanul Haque,** Assistant Professor, Department of CSE, Daffodil International University. We also declare that neither this research nor any part of this research has been submitted elsewhere for the award of any degree or diploma.

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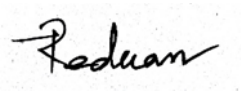

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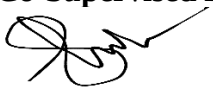

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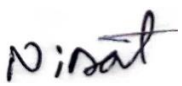

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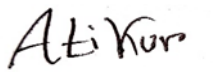

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ABSTRACT

Water is essential for life. Actually, that is not entirely true. Pure water is essential for life. On the contrary dirty and polluted water can take life. Water pollution is a major problem in our modern world. Polluted water can cause serious health problems. In our country the water pollution level is pretty high. In the water there can be a lot of hidden pollution that we can't see with our bare eye. Also, the water pollution level throughout the day can change. Water contains different kinds of minerals like lead and iron. But everything has limit. If water contains too much iron and lead it can cause serious health problems. That's why we need to monitor the water we drink and use. So, we decided to make a system that can monitor water throughout the day. Our system can tell if the water is drinkable or not or how much mineral is in the water. Our system also can generate weekly and daily report of water quality.

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CHAPTER 1

Introduction

1.1 Introduction:

Water is the source of life on Earth. It is necessary for the life of all living beings without exception on the planet. Water takes part in the assimilation of nutrients by cells and in their transportation throughout the body, regulates body temperature, and allows you to remove toxins from the body.

Water is the most important component of our habitat. After air, water is the second most important component necessary for human life. How important water is, evidenced by the fact that its content in various organs is 70 - 90%. With age, the amount of water in the body changes. A three-month-old fetus contains 90% water, a newborn 80%, an adult 70%. Water is present in all tissues of our body, although it is unevenly distributed: the brain contains - 75%, the heart - 75%, lungs - 85%, liver - 86%, kidneys - 83%, muscles - 75%, blood - 83%. Today, more than ever, it is very important for our body to receive clean water with a balanced mineral composition. It carries waste from our body, delivers lubrication to our joints, stabilizes our temperature and is the lifeblood of the cell.

Water is necessary to maintain all metabolic processes, it takes part in the assimilation of nutrients by cells. Digestion becomes possible only when food becomes water-soluble. Crushed tiny food particles gain the ability to penetrate the intestinal tissue into the blood and intracellular fluid. More than 85% of all metabolic processes in our body occur in the aquatic environment, so a lack of pure water inevitably leads to the formation of free radicals in the human blood, which leads to premature aging of the skin and, as a result, the formation of wrinkles.

Consumption of clean water ensures the normal functioning of the internal organs. It keeps our body flexible, lubricates our joints and helps nutrient penetration. A good supply of clean water to the body helps fight excess weight. This is reflected not only in a decrease in excessive appetite, but also in the fact that a sufficient amount of clean water helps to process already accumulated fat. These fat cells, with the help of a good water balance, are able to leave our body.

Water is a heat carrier and thermostat. It absorbs excess heat and removes it by evaporating through the skin and respiratory tract. Water moisturizes the mucous membranes and the eyeball. In the heat and during exercise, water is intensively evaporated from the surface of the body. Consumption of cool clean water, which is absorbed into the bloodstream from the stomach, provides timely cooling of your body, preventing overheating. During training, for the normal functioning of the body, it is necessary to drink in small portions about 1 liter per hour. The amount of water required to maintain water balance depends on age, physical activity, ambient temperature and humidity. The daily requirement of an adult is about 2.5 liters. What should be the drinking water? The quality of water acts as a characteristic of its composition and properties, which determines the suitability of water for specific uses. With centralized water supply, it is legally determined that the water supplied to the consumer must be pleasant and safe for health; it is understood that the content of harmful substances in water should not exceed the maximum permissible concentration.

1.2 Motivation

The water that comes to our homes from the water supply network is not always the kind of water that we want to drink. Due to the residual chlorine, the presence of abundant iron sediment, and the non-compliance of the quality standards with WHO's "Drinking water" for a number of indicators, people have a need to search for alternative sources of clean water: the use of packaged mineral and drinking water, filtered water. To do that at first people have to know about the quality of their water. If they find out that their water is not drinkable or harmful for health, they will be able to avoid drinking that water. That's what our system intends to do, let people know the quality of water.

1.3 The rationale of the study

The relationship between the morbidity of the population and the nature of water supply has long been noted. Even in the ancient world, some signs of water hazardous to health were known. However, only in the middle of the 19th century epidemiological observations and subsequent bacteriological discoveries by L. Pasteur and R. Koch made it possible to establish with sufficient certainty that water containing pathogenic microbes can contribute to the emergence and spread of diseases among the population. People also paid attention to the chemical composition of water as a possible cause of infectious diseases. At present,

when substantiating the hygienic standards for the quality of drinking water, its comprehensive studies are being carried out. Water can have both positive and negative effects on human health. First of all, this is due to the quality of the water used: its organoleptic properties, determined by color, taste and smell, as well as chemical and bacterial composition. People are still becoming ill, even dying because of water pollution. An indication for water quality is now necessity. According to who 3.575 million people die from water-related diseases per year. Is has to be reduced. That's why the topic for the research paper is chosen. Our system takes the value of TDS and tells user the condition of water. Also, it produces graph of TDS value for every day and week. So, user will be able to tell which part of the day water is more polluted. He will be able to take an informed decision if he should buy filter or not.

1.4 Research questions

a) Does it show the accurate description according to value of TDS?
b) Does it classify TDS?

The impact of water quality on human health was noted in ancient times. For example, Hippocrates recommended the use of boiled water. According to experts, 800 million people around the globe suffer from diseases caused by the lack of drinking water. Among them are gastrointestinal diseases, cataracts, swamp fever, etc. At high concentrations of fluoride, fluorosis develops (especially in children). Teeth darken, crumble and break. A sign of fluorosis is staining of tooth enamel. The optimal fluoride content for humans is on average 0.7 - 1.5 mg / l.

The quality of drinking water is preserved for a long time due to its enrichment with silver ions. But the exceeded concentration of silver causes changes in the vascular and nervous tissues of the brain and spinal cord. The maximum permissible concentration of silver ions in water is 0.05 mg / l. The term "TDS" refers to the total dissolved solids (total mineralization) and is a numerical value indicating the presence of impurities in a solution, most commonly water. TDS is measured in milligrams per liter, commonly referred to as parts per million, or ppm for short. Our system can show accurate description of each TDS value. Our system classifies TDS in 9 different class.

1.5 Expected Output

Expected output of our project is to let people know about the quality of water they are drinking. With our system people will know if the water is drinkable or not. Our system will be able to tell what TDS value means and what water of specific TDS value contain. Our system will generate graph of TDS value for day and week, so by monitoring those users will take informed decision about the water they use, they will be able to avoid polluted water and save themselves from water related disease.

1.6 Layout of the Report

- Chapter 1 have demonstrated an introduction to the project with its motivation, research questions and expected outcome.
- Chapter 2 will have "Background" demonstrates introduction, related works, research summary and challenges.
- Chapter 3 will have Research Methodology.
- Chapter 4 will have Experimental Results and Discussion.
- Chapter 5 Impact on Society, Environment and Sustainability
- Chapter 6 will have Summary and Conclusion.

CHAPTER 2

Background Study

We are going to discuss other works that are related, summary of the project and all the other challenges about our project. In related work we are going to discuss other projects that are similar to ours and their works. In the research summary we are going to show the summary of related projects. We will discuss how we can improve our project accuracy in the challenge section.

2.1 Water pollution

Negative changes in the physical, chemical and bacteriological properties of water caused by the introduction of excess inorganic substances (solid, liquid, gaseous), organic, radioactive or, finally, heat, which restrict or impede the use of water resources for drinking and household purposes.

2.1.1 Causes and Risk Factors

Water pollution is mainly caused by chemicals, bacteria, and other microorganisms, which are found in increased quantities in natural waters. Chemical, organic and inorganic (mineral) substances are found in the form of solutions, colloidal solutions and suspensions. The chemical composition of pollutants is determined by natural factors, for example, the decomposition of substances in soil and rocks, the development and death of aquatic organisms, as well as anthropogenic factors. Anthropogenic surface water pollutants include pesticides, surfactants, petroleum hydrocarbons, phenols, chlorine biphenyl derivatives and heavy metals: lead (Pb), copper (Cu), chromium (Cr), cadmium (Cd), mercury (Hg) and zinc (Zn), as well as heated waters (thermal pollution), which are especially dangerous for surface waters with slow flow or stagnant water. Almost all anthropogenic water pollutants are toxic to aquatic organisms. Most of the pollutants enter the water along with the wastewater. Other sources of water pollution are water and land transport, the use of pesticides and fertilizers, and municipal and industrial waste. Water resources are also polluted by eutrophication. The water cycle in nature is disrupted due to the destruction of forests, monoculture agriculture, improper and excessive farming, and urbanization.

Types of water pollution depending on the origin:

a) Natural - Those that come from impurities contained in surface and groundwater, for example, salt, pollution with iron compounds;

b) Artificial - in other words, anthropogenic, that is, associated with human activities, for example, water flowing down from agricultural land, municipal dumps. Artificial pollutants can be divided into biological (bacteria, viruses, fungi, algae) and chemical (oils, gasoline, fertilizers, pesticides, acids, alkalis).

Depending on the persistence of impurities:

a) Degradable - containing organic substances, potentially toxic, but subject to chemical decomposition into simple inorganic compounds with the participation of bacteria;
b) Non-degradable - containing substances that are not subject to significant chemical changes and the effects of microorganisms (heavy metal salts);
c) Resistant to decomposition - containing biodegradable substances in a small amount and remaining in the environment in a stable form for a long period (pesticides, phenols, petroleum products).

Types of water pollution depending on the source:

a) Local sources - wastewater discharged in an organized manner through sewer systems, mainly by industrial enterprises and urban agglomerations;
b) Surface or territory pollution - pollution washed away by atmospheric precipitation from urbanized areas without sewerage systems, as well as from agricultural and forest lands;
c) Pollution from linear or strip sources - pollution from transport communications produced by vehicles and washed off the surface of roads or railways, as well as pollution from pipelines, gas pipelines, sewer canals.

According to experts, there is a whole list of diseases that a person can catch with dirty water. “These include most of the intestinal infections, such as cholera, typhoid fever, paraphytosis, salmonellosis, dysentery and others. In addition, the role of water in the spread of such pathology as epidemic hepatitis has also been proven. Even polio can be spread through such a source. And this list can also include a large group of so-called

anthropozoonoses transmitted from sick animals to humans," says Evgenia Parshina. Also, experts often refer to this list adenoviral infections, enterovirus pathologies. And some viruses, such as, for example, the same hepatitis A, can show such high resistance that even when boiling water, they do not die immediately. All these diseases are quite serious and often do not go away without consequences. At the same time, it should be understood that water from water pipelines across Russia does not threaten such diseases. All water in the system is properly treated and monitored for compliance with safety standards. Caution should be observed only when in contact with "wild" bodies of water.

Types of diseases:

Doctors distinguish several groups of diseases that can be obtained through water. So, Evgenia Parshina notes that there are 4 groups, which include:

a) Diseases caused by water contaminated with pathogens such as typhoid, cholera, dysentery, poliomyelitis, gastroenteritis.
b) Local diseases of the skin and mucous membranes arising from the use of contaminated water for washing.
c) Waterborne parasite diseases such as schistosomiasis.
d) Diseases caused by insect vectors that live and reproduce in water, the most famous are malaria and yellow fever.

"The most dangerous for health and the most widespread on our planet is the group where water contaminated with pathogens is used directly for drinking and cooking," notes Evgenia Parshina. Most often we are talking about exotic countries or third world countries. Outbreaks of infections can be observed in masse where people took water from one contaminated source.

2.2 Related Work

Water quality monitoring system based on wsn by Teng Wang, ipack vinn excellence centre, Ict school of Kth proposed a method of wirelessly monitor water [1]. Sensor based water quality monitoring system by Bishwajit Paul, BRAC university proposed method of sensor-based water quality monitoring [2]. Design, implementation, and evaluation of an online water quality monitoring in lake saimaa, Finland by Abdelrahman Azzuni proposed

a method of monitoring water quality online [3]. Monitoring of water quality and establishing maintenance system in a rural community of Nepal by Santosh Man Shrestha successfully monitored water quality [4]. Real-time water quality monitoring system by Yashwanth Gowda K. N, Vishali C, Sumalatha S.J and Spoorth G.B showed a water quality monitoring system that monitors water in real time [5].

2.3 Research Summary

In this table 2.1, we have shown the research paper summary in a simple tabular form.

Table 2.1: Research paper summary

SL No	**Author**	**Title**
1	Teng Wang	Water quality monitoring system based on wsn.
2	Bishwajit Paul	Sensor based water quality monitoring system.
3	Abdelrahman Azzuni	Design, implementation, and evaluation of an online water quality monitoring system.
4	Santosh Man Shrestha	Monitoring of water quality and establishing maintenance system in a rural community.
5	Yashwanth Gowda K. N, Vishali C, Sumalatha S.J And Spoorth G. B	Real-time water quality monitoring system.

For a long time, the presence of nitrates in water was considered as an indirect sign of domestic pollution, since nitrates are the end product of the decay of organic substances that enter the water source mainly with pollution. For example, in polluted wells, their content reaches 100 mg / l and more. However, exceeded concentrations of nitrates were also found in natural underground waters, in which nitrates are formed as a result of reduction processes occurring in soil and water. The concentration of nitrates at the level of 10 mg / l is safe and accepted as the maximum permissible in drinking water.

It is no exaggeration to say that high-quality water is one of the essential conditions for maintaining people's health. Tasty water is an earthly true gift. And it is protected by the state standard. Finally, we touch our expected goal for God's blessing, which we have thought to implement.

2.4 Scope of the problem

In making the system we tried to use different kind of methods. At first, we tried to make pie chart. But end result was disappointing. After days of research, we decided to make an app that shows water quality in graph. When we were trying to find best accuracy this time few methods provided good accuracy but they had some drawbacks and they are time consuming. Finally, we were able to find method that matches our expectations and also time efficient.

Some of the examples of problems while searching for a best algorithm,

- Graph was not showing accurate value
- Having problem with data implementation

2.5 Challenges

Collecting data accurately was one of the big challenges. Without data the prediction is not possible and our system cannot predict. Another challenge was processing all the data. Collecting data automatically and then input that in our system automatically was difficult. After getting the data our system will make graph off the data for 24 hour and seven days. Making the graph was very challenging. Then our system will predict which time frame has the most water pollution.

Here are few more challenges for us,

- Choosing the perfect visual representation
- Dealing with the data
- Input data correctly
- Implementation the dataset on system

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Water quality analysis

In our system we have collected data from 7 different sources. We try our best to predict the accurate result. We have tested water for 7 days continuously. In few times period we got same result. To get proper result we have done data processing. We have also data set for testing purpose.

3.2 Data Collection Procedure

We use seven different sources for our data. Fast one was tap water from house. 2nd was from tube wells. 3rd one was supply water from wasa. 4th one was rain water. 5th one was filtered water. 6th one was mineral water. Final one was boiled water. Then we continuously collected data of supply water by Wasa. We collected for 7 days straight so that we can make comparison graph. We use xiaomi TDS meter to collect the data. This device measures the hardness of water. There are several buts. This is not a laboratory device, and the measurement is based on measuring the resistance of water, but it is measured by a TDS device, which stands for Total Dissolved Solids - the total content of dissolved solids. Some people call it a "salt meter" because salt fits perfectly with what the device measures.

The lower the reading of the device, the better, the units change from 0 to 1000, but when the reading is more than 1000 (units per million particles), it is not recommended to use water.

It is extremely simple to measure - we dip the contacts in water and the measurement result appears on the screen almost immediately. The results "float", but only by plus or minus 5 units, at least that's how it happens with our device.

- Water in the faucet in living place - 480
- Water in the filter-cooler in the hall (We checked it on several floors in different coolers) - 320-360
- Water in the faucet at home - 180

- Water at home after the filter - 160
- Water after the filter built into the refrigerator - 170
- Mineral water – 220

Table 3.1: Dataset details

Different water source:

Tap water	380
Tube wells	160
Supply water	490
Mineral water	220
Rain water	55
Filtered water	320
Boiled water	290

Table3.2: Dataset of 24-hour time frame: supply water

12 am - 440	8 am - 480	4 pm - 550
1 am - 465	9 am - 490	5 pm - 530
2 am - 470	10 am - 470	6 pm - 500
3 am - 460	11 am - 475	7 pm - 490
4 am - 480	12 pm - 475	8 pm - 485
5 am - 480	1 pm - 485	9 pm - 460
6 am - 475	2 pm - 500	10 pm - 450
7 am - 485	3 pm - 520	11 pm - 430

Table 3.3: Dataset of 7-day time frame: supply water (average)

Sunday	481
Monday	484
Tuesday	479
Wednesday	483
Thursday	477
Friday	486
Saturday	478

3.3 Statistical Analysis

For our project we have collected a lot of data. We have 24-hour data and weekly data. We have Dada from different sources. From table 3.1 it is apparent that supply water has the highest TDS value. 2nd highest is tap water. Rain water has the lowest TDS. 2nd lowest is Tube wells. From table 3.2 it is apparent that mid-day has the highest TDS where midnight has the lowest. From table 3.3 it is apparent that TDS value average for everyday of the week is similar.

3.4 Applied Mechanism

We have gathered water quality information of our local area and we have tested the quality of water with TDS meter. TDS meter has gives us information about total dissolve solid in water. Soluble non-electrolytes present in water will not add electrical conductivity to the water, i.e. a conductometric TDS meter immersed in sweet tea brewed with distilled water will show an extremely low value, but when the water is evaporated and weighed, the solids value will be high. TDS (total dissolved solids) means the mass of solid residue that will be obtained if all the water is evaporated. Soluble electrolytes (salts, acids, bases), and soluble non-electrolytes, and insoluble solids (sand, clay), whose total mass is called TDS in chemistry, will remain in the solid residue. By the way, in domestic terminology there is the term "total salt content", which much more accurately reflects the value that the conductometer measures.

3.5 Implementation Requirements

To implement our project, we need a tds meter which will determine the amount of tds in water. Then we need various water source of which we have to measure tds value. Tds has to be measured in multiple times a day to get accurate mean value. We need to keep measuring every day for weeks of same source to get accurate idea of tds value.

Chapter 4

Experimental Results and Discussion

4.1 Experimental Setup

This chapter describes and analyzes in detail all the results obtained and the identified patterns. The presentation of the material is structured in accordance with the objectives of the research and is accompanied by illustrations. At the same time, the results and discussion for each research methodology are prescribed in separate sections. The number of sections in this chapter corresponds to the number of methods used, plus a separate section that provides a general discussion of the results of the entire study. The section includes the generalization and evaluation of research results, and their interpretation. This section is aimed at determining the place of the results obtained during the research topic. The discussion contains an assessment of the reliability of the results obtained and their comparison with the results of domestic and foreign works, proposals for further areas of work, justification of the need for additional research, discussion of negative results.

4.2 Experimental Results & Analysis

According to WHO: TDS Level (Milligram/Litre),

Less than 50 - Unacceptable as it lacks essential minerals

Our body need minerals. Drinking water with appropriate amount of minerals can full fill the need of minerals in our body. As this water has less than 50 milligram minerals per liter, this is not enough minerals.

50-150, Acceptable for drinking. The TDS level is ideal for areas where the water polluted by sewage or industrial waste. As this water has 50 to 150 milligram minerals per liter, this is acceptable amount of minerals for our body.

150-250 Good. The water is ideal for people with cardiovascular disease. As this water has 1500 to 250 milligram minerals per liter, this is good amount of minerals for our body.

250-350 Good. The water is ideal for people with cardio vascular disease;

350-500 fairly acceptable. As this water has 350 to 500 milligram minerals per liter, this is fairly acceptable amount of minerals for our body. Though lower amount would be better.

500-900 less acceptable. As this water has 500 to 900 milligram minerals per liter, this is not good amount of minerals for body. It is not preferred to drink this in regular basis.

900-1200 Least acceptable. Avoid drinking water which has a TDS level of 900. This is not acceptable for drinking. It has way too much minerals. This amount of mineral can cause health concern.

1200-2000 Water is not acceptable for drinking.

Height amount of TDS we found in our testing is 550 which is still acceptable for drinking. But it is not a recommended thing to do on daily basis. Good thing is aside from supply water, all other source has lower than 500 TDS value. Also, the supply water has more than 500 value on specific time period and not all the time. Rain water and Tube wells water is excellent drinking water. The TDS value is perfect for drinking. And these waters don't need any additional cost. Filtered water is also good but filter has additional cost. Mineral water another good candidate for drinking water but it is more expensive option compared to others.

4.3 Discussion

It can be said that in our testing area water quality was not too bad as we didn't find horrible TDS value. But that doesn't mean bad TDS doesn't exist. Of course, it exists. In a lot of places TDS can be very bad. Especially in industrial areas TDS values are pretty high. If industrial waste is not taken care properly and it mixes up with water, TDS value can sky rocket! It is very important that TDS value of drinking water stays in limit. If it goes pass 1000, that can be very bad for health.

CHAPTER 5

Impact on Society, Environment and Sustainability

5.1 Impact on society

Water pollution is a big environmental problem, but modern methods of purification do not solve it. This can lead to serious environmental consequences, since no living creature can survive without water. To solve the problem, it is necessary to determine the sources of pollution and existing approaches to their solution. The deterioration of the qualitative composition of water interferes with the normal existence of representatives of flora and fauna. Failures occur in the body that lead to health problems. Viral and bacterial infections in 80% of cases are observed when drinking dirty drinking water or appear after swimming in open water. The hydrosphere creates favorable conditions for the reproduction of pathogenic microorganisms. Periodic releases from pharmaceutical factories producing antibiotics lead to the development of resistance in bacteria. As a result of biological contamination, superinfection appears and the effectiveness of conservative treatment decreases.

5.2 Impact on Environment

To sustain life on Earth, we need clean drinking water. But due to the fact that water is polluted in many ways, it is becoming increasingly difficult to find clean sources of water to drink. Even with the use of high-tech water purification systems, we are at risk of drinking unclean water. With our population increasing every day, water sources ever shrinking, and water pollution at its peak, we are about to reach a serious problem with drinking water when it is not controlled. Due to water pollution, the life of aquatic organisms is in danger. We are already seeing the disappearance of many species of aquatic plants and animals. We hear news about whales, sharks and many other aquatic creatures found with tons of plastic in their stomachs.

With increasing oil spills and plastic pollution, the balance of the aquatic ecosystem is being disrupted, leading to a chain of adverse reactions. The microplastics that tiny organisms consume move up the chain. These organisms are eaten by small fish, which are then eaten by large fish. When we consume these large fish, we accumulate microplastics in our bodies, leading to serious health problems. Irrigation water is often obtained from local reservoirs. But when toxic chemicals contaminate these bodies of water, they can

damage the nutritional value of crops and be harmful to the people who consume those crops.

5.3 Ethical Aspects

The planet's resources are running out. Catastrophically quickly polluted air and water. Fertile lands turn into sands. Forest areas are shrinking before our eyes. Mountains of garbage literally fall out onto the planet; man provokes natural disasters. Possible global warming, depletion of the ozone layer, acid rain, "blooming" of water bodies, the accumulation of toxic and radioactive waste pose a threat to survival. Of course, there are countries for which these problems are not so acute. But, in general, all of humanity is concerned about them and therefore they are global. However, in many states the problems of environmental protection simply do not reach the hands. The American ecologist J. Holliman writes: “Where mass unemployment is endemic, disease and poverty are rampant, and a growing population is tearing society at the seams, environmental protection will be looked upon as a luxury that those who stand at the top of the ladder can afford. progress." The complex of environmental problems is so voluminous and different in different regions of the world that it is impossible to find standard or easy solutions. Let's try to outline the main problems that are planetary in nature and concern all people. Water pollution is one of the main problems. Our project is trying to address some of the water related problems. If people starting to use a simple water monitoring device, and if they report bad water quality to authority, then supply of bad drinking water can be stopped.

5.4 Sustainability Plan

Access to water is a human right. Water resources are critical to sustainable development and the eradication of poverty and hunger. There is an inextricable link between water resources, energy, food security and nutrition. Water resources are absolutely essential for human development and human health and well-being, and are vital to achieving the Sustainable Development Goals and other relevant social, environmental and economic goals. But inefficient and unsustainable management and operation practices, as well as increased uncertainty and risks caused by climate change and other factors, are putting many water-related ecosystems at risk. We have plan to encourage public to use water monitoring device. So that they can take informed decision about their drinking water.

CHAPTER 6

Conclusion and Future works

6.1 Summary of the Study

In this paper for the Water quality monitoring, we have successfully monitored water from 7 different source and for weeks. After that we have analyzed the data if the water is acceptable for drinking or not. If the water is acceptable for drinking, how much healthy the water is according to TDS value, we have managed to find it. We have made mobile app that will display those value with proper description of the water condition. The app will show daily and weekly graph of the data. It will show which time frame has highest and lowest TDS value.

6.2 Conclusion

After determining the qualities of water from various sources, the following results were obtained. Tap water has a noticeable higher TDS than others. This water sample does not meet the highest standard for the following parameters: color, transparency and iron cation content. Distilled water meets the state standard, except for the smell and pH of the environment. It does not contain any impurities or salts and is suitable for drinking. None of the water samples taken from different sources for research were extremely bad. Drinking such drinking water won't affect health badly. The solution to the problem of poor-quality drinking water has two sides. Firstly, this includes the environmental and social problems of the city, general pollution of water bodies. Secondly, there is the problem of outdated communications - rusty pipes. Water that has been treated in a sewage treatment plant, passing through such pipes, becomes polluted again. Therefore, it is necessary to replace old pipes with new ones throughout the city. All the proposed measures require large financial costs and joint actions of the city administration. As a result of the work carried out, it was argued that the water taken for this research is suitable for drinking.

6.3 Implication for Further Study

The collection of data we want to increase in the future. We want to taste every source of water for months. We want to cover large area. We want to make our app more robust in

future. As we want to cove large area, we have to make our app online. So, a lot of people from across the country can provide water quality data very easily. In industrial areas water quality is pretty bad, so covering all industrial area would be first priority. Our ultimate goal is to cover the entire country and make a huge report of water quality of whole country covering each district. We want to store data on online server and make the app completely online so user can use the app from anywhere and see water quality data of any area they want. In future we want to add some new additional features to app like adding more different kinds of chart and graph. Bangladesh has a huge population, lot of them live under poverty. Getting clean and pure water for them is a challenge. So, we want to make a system where in map (using modified google map api) clean water source will be indicated in green, Impure water source will be indicated in red and somewhat pure water source will be indicated in yellow. This way people will be able to find clean water source near them very easily.

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