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EFFECTS OF STORAGE TEMPERATURE AND SUNLIGHT EXPOSURE ON THE DRINKING BOTTLED WATER

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Abstract: The importance of bottled water helps remove heavy metals and eliminate microorganisms. There are many studies on how to maintain water quality, for example continuous calibration of water, and the number of calibration times depends on the percentage of pollution at the level of the province or city. In this study, five samples were collected from different companies distributed at the governorate level. The first sample was analyzed after exposure to sunlight from 11/20/2022 to 4/3/2023. During the measurement, the temperature of the second sample reaches 30 degrees Celsius for half an hour, and the third sample is not exposed to any conditions. The results were collected and compared. The aim of this study is to design a versatile device, for example in homes or in laboratories, to monitor water quality. Using sensors, this device can measure (Total Dissolved Solids (TDS), potential of hydrogen, temperature, turbidity, and hardness). Nodemcu was used, which is linked to Thingspeak and Excel so that it can monitor telemetry samples, as well as store the read. Some properties that have not been studied can be studied, as well as the type of material used in the manufacture.

Introduction:

This chapter includes some of the problems faced by researchers, as well as the measurement of physical and chemical properties, and also touched on some unstudied project work deals with Behaviors of Water physical properties.

Problem Statement:

Articles by multiple researchers were reviewed between 2018 and 2022 and errors were recorded. Adopting undeveloped measurement methods and not exposing samples to different conditions before measuring compounds. There is no mistake in using plastic or glass containers for water. One must rely on advanced measurement methods, especially when measuring pH Monitoring must be periodically water and analyze its compounds before starting the delivery process in the pipeline to protect the pipeline from corrosion.

The objective of this Project is:

1. To collect the most common of drinking water companies in Hilla City.
2. To analysis the properties of drinking water (Tds, Ph, Hardness and Turbidity) under sun-light and heating up to 55℃.
3. To fabricate Reference Simple Drinking Water device.

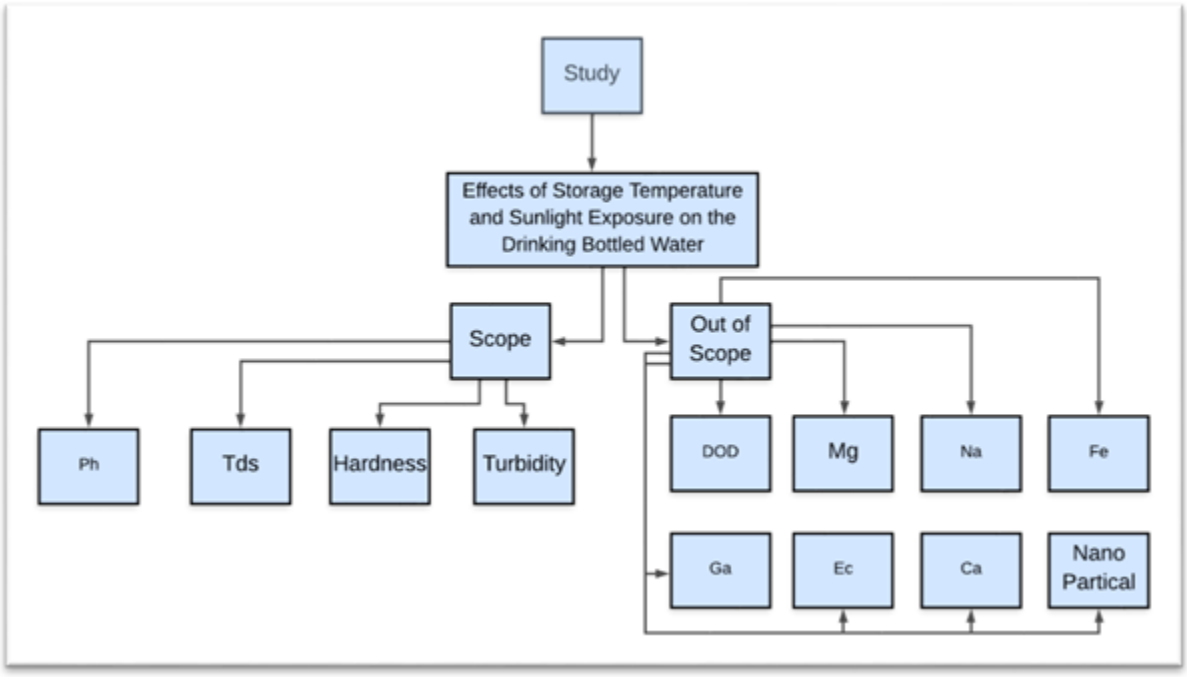


Figure 1 Project study

Scope of study:

potential of hydrogen

The technical definition of pH is that it is a measurement of hydrogen ion (H+) activity and is reported as the inverse of the logarithm of hydrogen ion activity. In general, water with a pH < 7 > 7 is considered basic. The normal pH range in surface water systems is 6.5 to 8.5 and for groundwater systems it is 6 to 8.5. The pH of pure water (H20) is 7 at 25°C Low pH water may contain high levels of toxic metals Water with a pH > 8.5 may indicate hard water or scaly. Hard water is not dangerous to health.

Total Dissolved Solids (TDS)

TDS is the sum of dissolved solids . Commonly symbolized by TDS, it expresses the amount of organic and inorganic substances contained in a liquid, whether suspended in molecular or ionic form . The term is often used for water to describe its portability.

Turbidity

Turbidity is the having impurities inside any liquid and is caused by small particles that are normally invisible to the naked eye and are like smoke in the air. Turbidity measurement is an essential process in water quality testing.

Hardness

The simple definition of water hardness is the amount of calcium and magnesium dissolved in water. Hard water is rich in dissolved minerals, mainly calcium and magnesium. Drinking hard water is generally. safe and can sometimes have positive health effects. Benefits of hard water include meeting the body's need for essential minerals like calcium and magnesium Drinking hard water causes simple intestinal and skin infections.

Pollution of Water

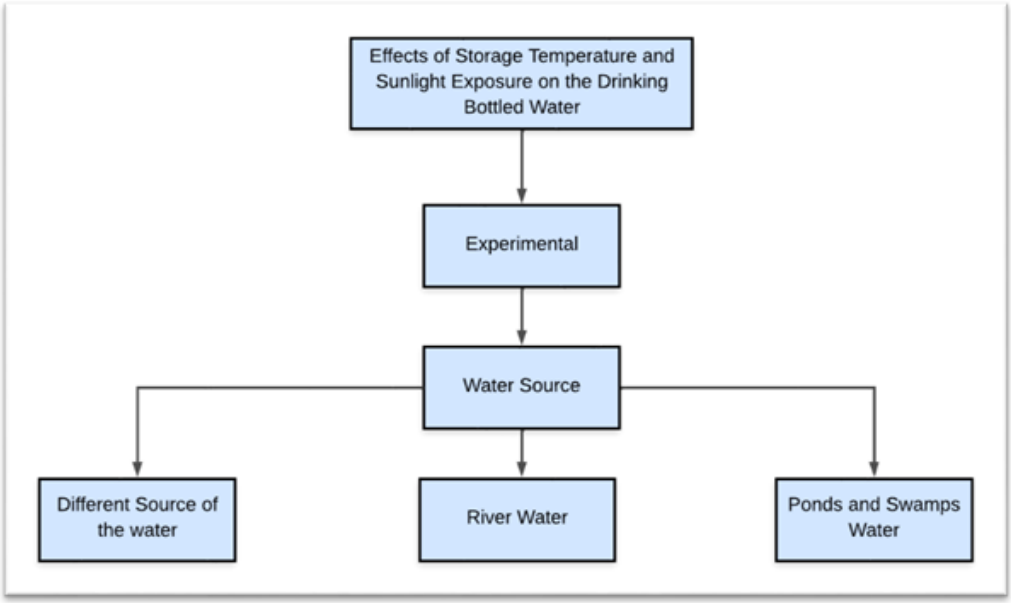


Figure 2 Pollination of water

The study case of this study deals with the process; reducing pollutants in water by exposing it to temperature The purpose of this study is that there are no advanced methods in the water purification process, so heat INBS; used to get rid of viruses and bacteria Tools of this results of this study, the process of; water to heat was not a useful way to get rid of bacteria; viruses. After many studies, it was confirmed that; increase their activity when the temperature increases, and ;the techniques used for heat were not advanced techniques, ;example relying on burning by cutting trees, which leads towns; environmental pollution. Written by K. Obiri-Danso, E. Amevor, L. Andoh, and K. Jones, Journal of Science and Technology (Ghana), vol. 24, no. 2. 2005.[1].

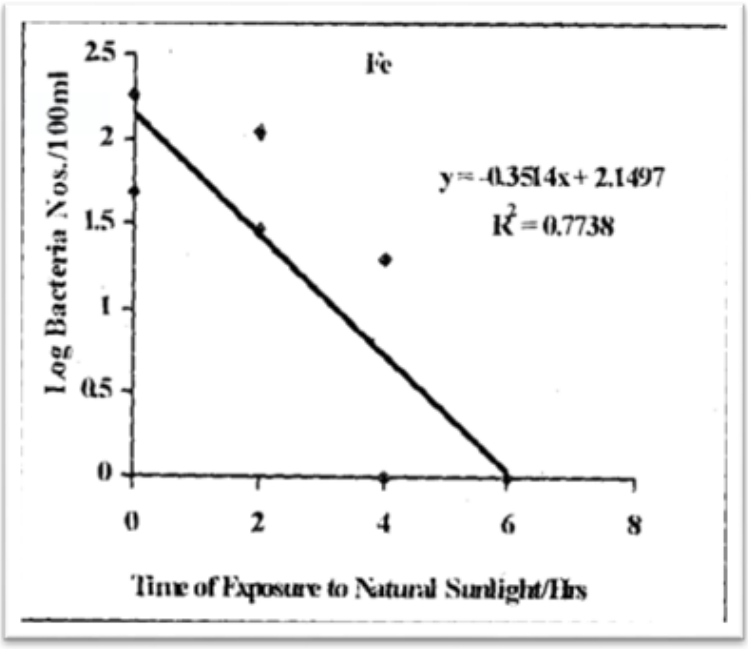


Figure 3 Relationship between enterococci numbers (Logo) in weli water in different water [1]

The study case of this study In order to preserve people's; from disease, there must be water control represented in; sampling process. There must be a preliminary ;process to find out the percentages of these ;according to the percentages announced by the Ministry ;Health, and then there must be a calibration process to treat INBS;there is a rise or decrease in concentrations The purpose of ;study is to monitor the percentage of pollution in the river wateriness; to see if it is suitable for human use or not the tools of this ;TDS Sensor, PH sensor and DOD the results of this study ;first test includes the result of examining the river water ;samples were taken and examined. It was found that the pH rations; were close to the ratios announced by the Ministry of Health. Inns; the second test, it was found that the acidity rate was high, songs; there must be periodic checks to monitor the quality of theater. Written by P. Chatanga, V. Ntuli, E. Mugomeri, T. Keketsi, and N. V. T. Chikowore, " River, Lesotho," Egypt. J. Aquat. Res., vol. 45, no. 1, pp. 45–51, 2019,[9].

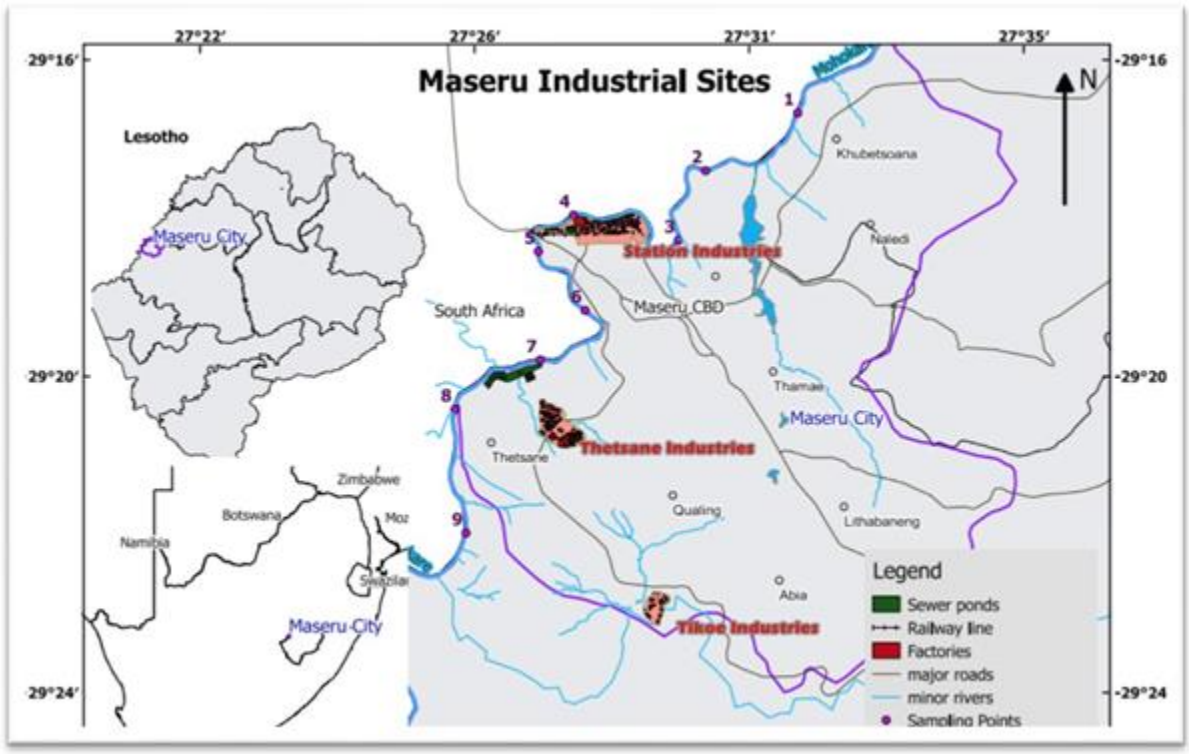


Figure 4 Map of the city of Maseru City showing Mohokare River and the sampling points.[9]

In the study case of this study, Rural areas, are the areas where there are no health and control services. They suffer from many diseases. After many studies, it was revealed that the main cause of diseases is water. Water samples were collected and analyzed. The first study was a simple undeveloped analysis, for example, PH only, and after many studies that lasted for several months, they were able to carry out the process of developing sample analysis, and it became inclusive The purpose of this study is Mohave strong treatment systems to face the risks that are likely to occur when humans use this water for drinking purposes before the process of detecting pollutants tools of this study PH sensor, TDS sensor, color and Temp sensor The results of this study, after the development, old techniques were removed and modern techniques were used in the process of water analysis. Good results were obtained that had a great role in protecting people from diseases. Written by F. García-Ávila, A. Avilés-Añazco, E. Sánchez-Cordero, L.

Valdiviezo-Gonzáles, and M. D. T. Ordoñez,South African J. Chem. Eng., vol. 37, no.

December 2020, pp. 141–149, 2021[16].

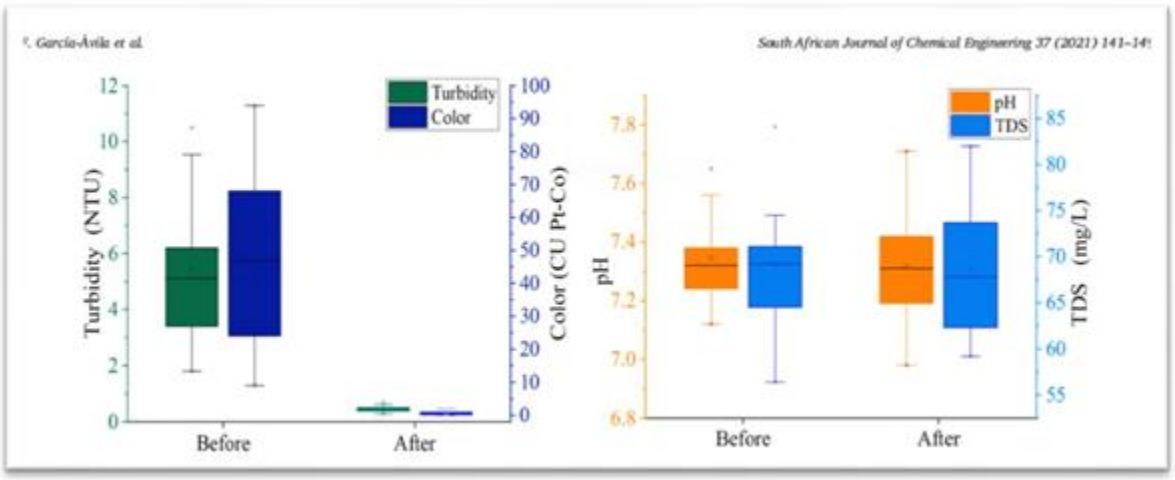


Figure 5 Variation of the physical and chemical parameters of the treated water: before modernization and after modernization [16].

The Study case of this Study This study deals with pond water and the problems that can be obtained by using this water. A lot of research was done to study the causes of water pollution, and there were many reasons, the first of which was the dumping of waste in ponds, as well as physical and chemical compounds when analyzed and found a significant increase in their proportions. Compared to the percentages declared by the Ministry of Health, this water is not suitable for drinking the purpose of this study In order to have a clean, pollution-free environment and keep people from disease, pond water is not the best solution. Well water was used as a substitute tools of this study TDS Sensor , PH sensor and DOD The results of this study were samples were taken and analyzed, and there were treatment processes during the analysis by adding materials to prevent the decrease in compounds, for example, adding phosphates to prevent a decrease in the acidity of the water. Written by M. S. Islam, K. Nakagawa, M. Abdullah-Al-Mamun, M. A. B. Siddique, and R. Berndtsson, Environ. Challenges, vol. 6, no. August 2021, p. 100434, 2022, [17].

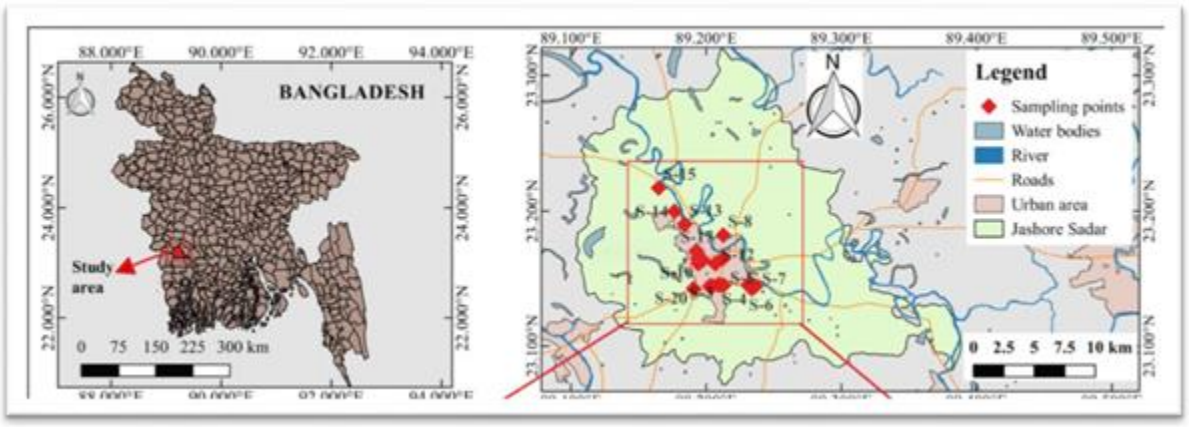


Figure 6 Locations showing the study area in Bangladesh, sampling points in Jashore Sadar upazila, and sampling points[17].

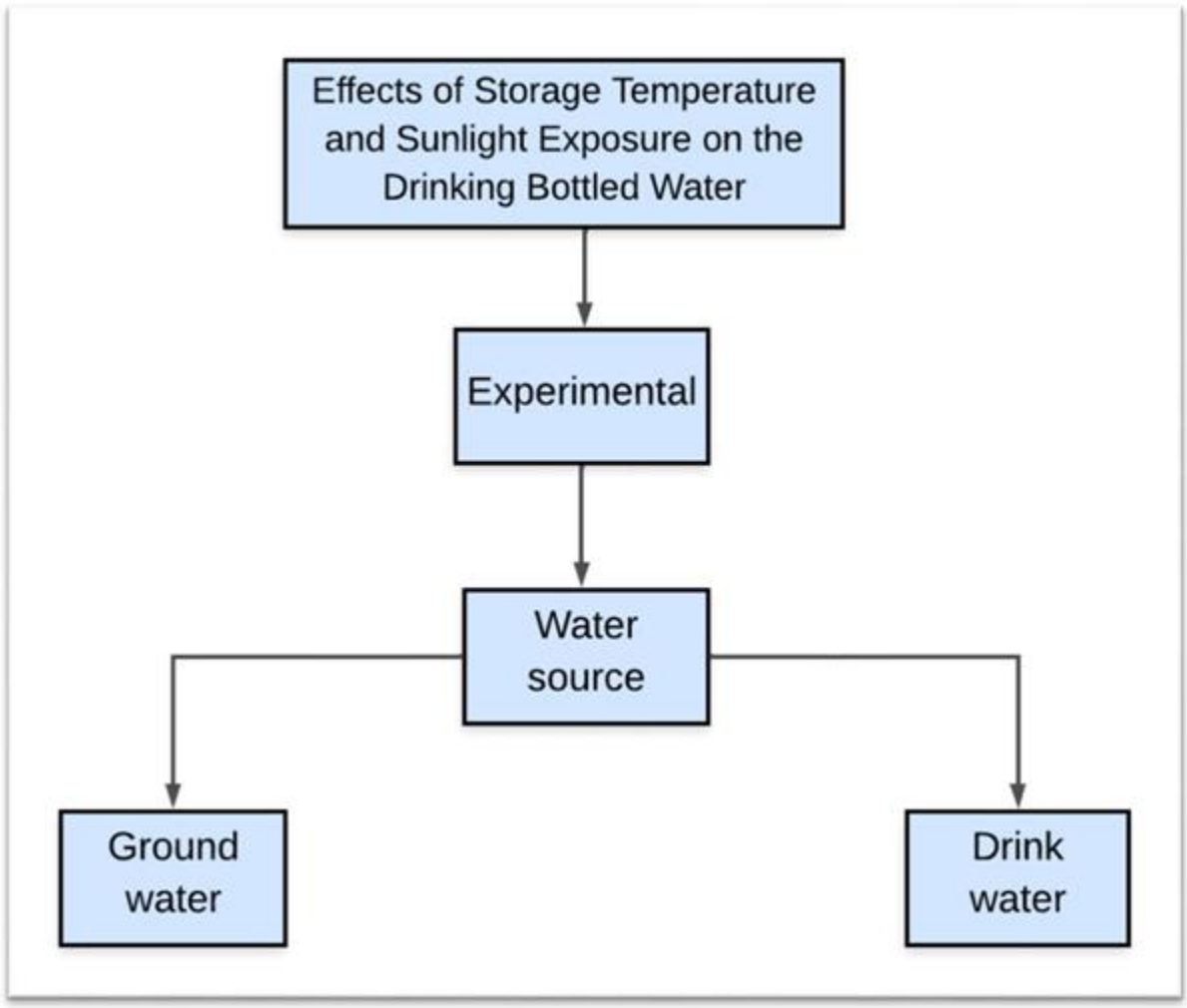


Figure 7 Water Quality

Water Quality:

The study case of this Study Work to know the quality ;groundwater by conducting many tests, as well as the of groundwater, depending on the location and teethe purpose of this study is to rely mainly on ;use of artificial intelligence, for example, this is done ;publishing maps of areas where groundwater is available inns; abundance, and after that the location is determined using (GPS) after that it is directed to conduct an experimental test ;represents whether this water is valid To drink or not, and ;reading is submitted via (G S M) to the authorities ;for water quality control tools of this study TDS Sensor, phones Sensor, Temp Sensor, CL and Na The results of this study warns based on basic criteria. There are many such studies, one in summer and the other in the winter. The rate was higher than inns the summer because of climatic factors represented by and other factors. However, these principles are not relied upon. Samples of this water are taken, analyzed and many ;are performed to see if Was this water good or not, ;compared the percentages of analysis of this water with ;percentages declared by the Ministry. Written by M. K. Jha, A. Shekhar, and M. A. Jenifer,Water Res., vol. 179, p. 115867, 2020, [2].

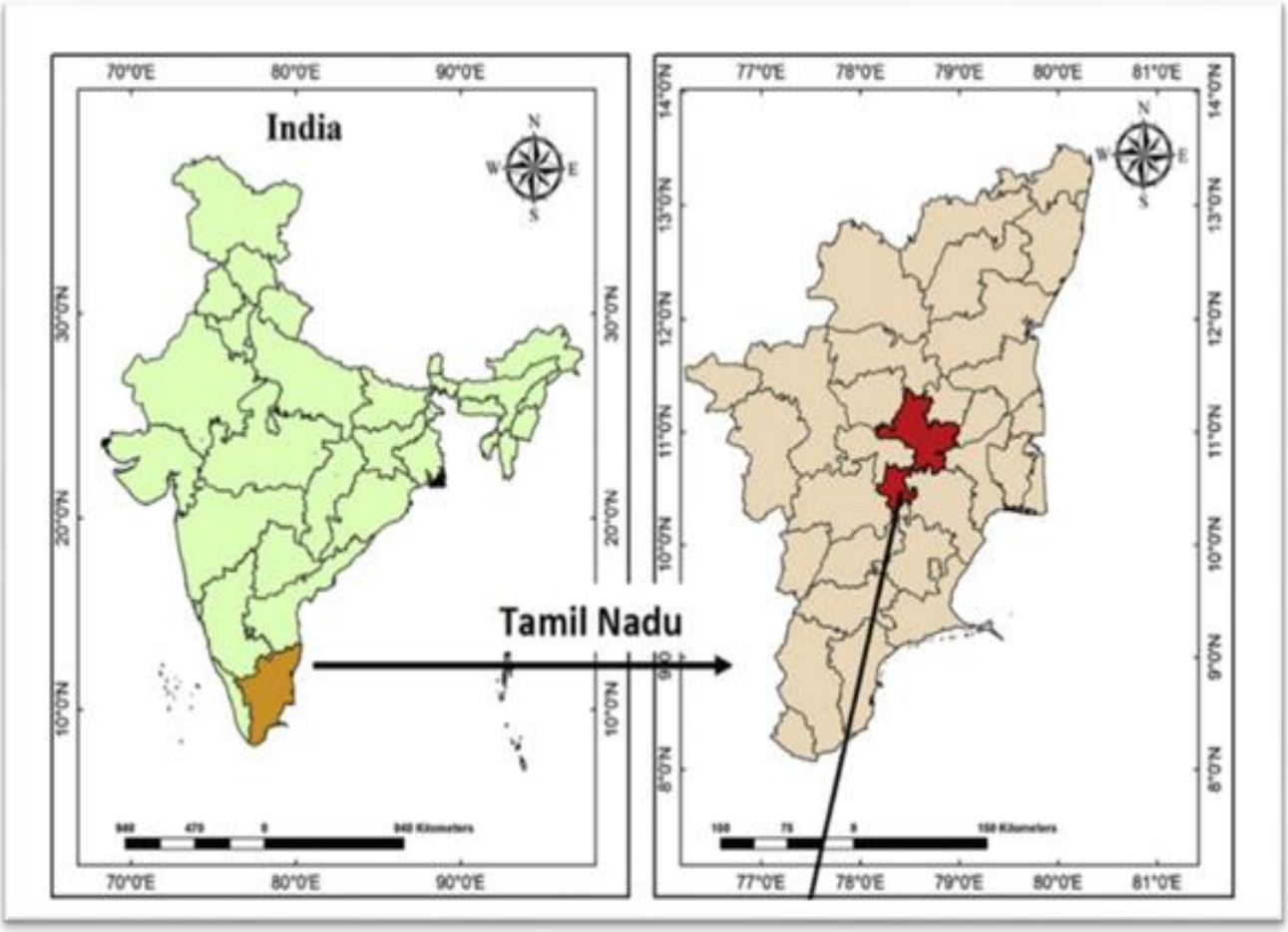


Figure 8 Location map of the study area with the location of groundwater sampling sites [2].

The study case of this study In order to keep pace with development in the field of technology, advanced methods mustangs be used in the process of detecting the quality of drinking water because water is one of the important factors in the human body There must be periodic or monthly calibration processes, depending on the percentage of pollution present in The purpose ;this study was the main reason for monitoring the quality ;drinking water due to the increase in the number of deaths. After many studies that lasted for several months, quick ;were found to enable the owners of the station to analyze ;physical and chemical factors of the water, and there must beings ;treatment processes in the event that these rates were high orbs ;low according to the percentages announced ;the Ministry of Health tools of this Study PH sensor, TDS ;sensor, conductivity, cl, k and Na The results of this study havens ;shown after many studies that the optimal solution is not ;the use of modern methods in the process of water analysis. There should be continuous monitoring of river water and otherness; water sources to prevent throwing waste or damaged; and other pollutants into the water. Written by X. Han, X. Liu, D. Gao, B. Ma, X. Gao, and M.

Cheng, Ecol. Indic., vol. 144, no. June, p. 109501, 2022 [3].

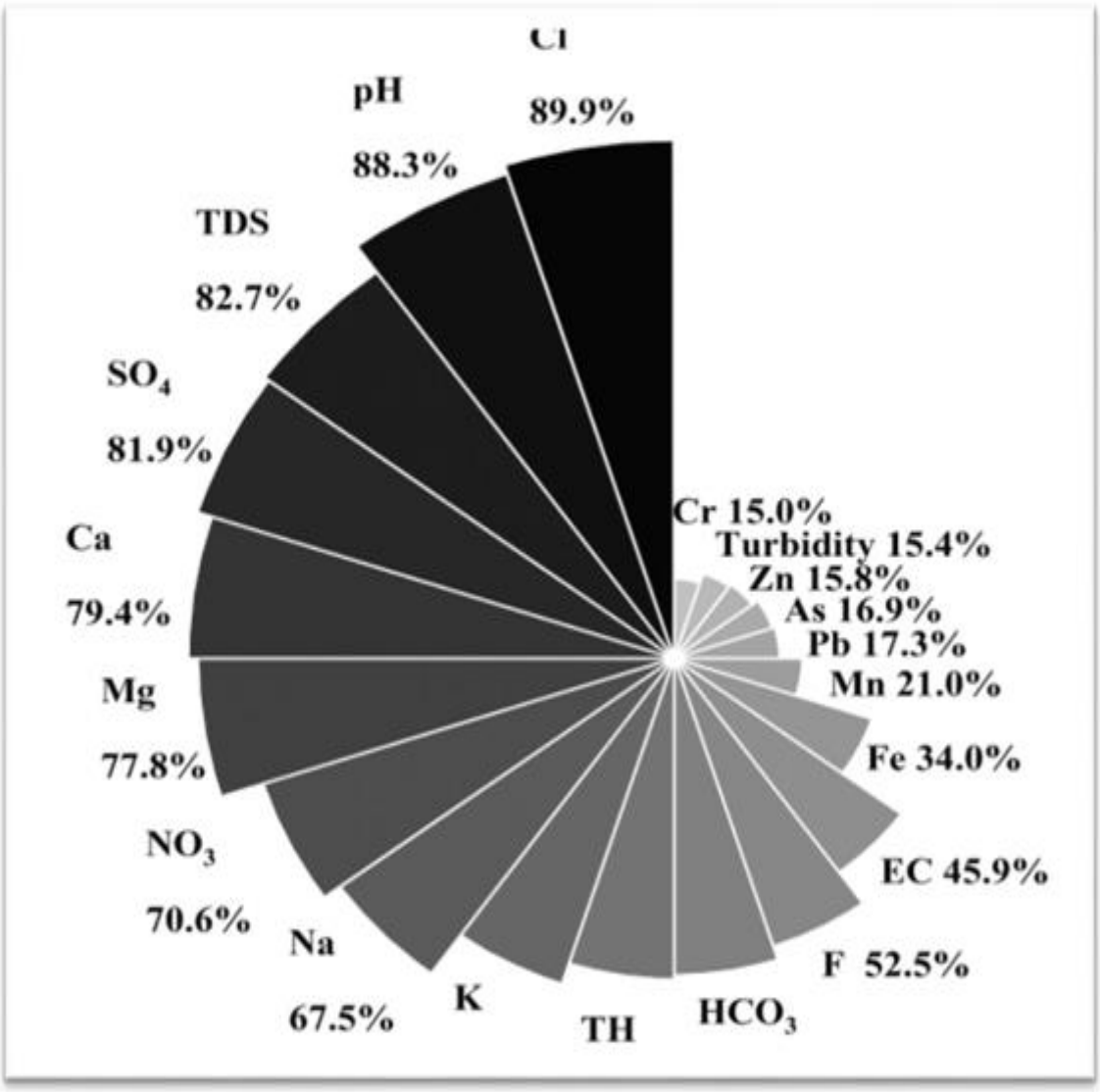


Figure 9 The most frequently selected parameters for generating drinking water [3].

The study case of this study is concerned with ;process of developing the quality of drinking water ;measuring the ratio (T D S) for different companies ;comparing which is the best when these samples are exposed to towns different conditions The purpose of this study is to enable the process of water analysis, but this study is not for ;only, but for different water sources tools of this Study ;Sensor the results of this study After the samples were ;to different analyzed conditions, a discrepancy appeared in ;proportions of the companies, because they underwent ;preliminary calibration process before analysis. For example, when exposed to sunlight, an interaction occurs between compounds, the growth of harmful bacteria, and a change in taste of water. Because (TDS) rises when exposed to heat,; proportions vary depending on climatic conditions. Written by R. Devesa and A. M.

Dietrich,Desalination,vol. 439, no. November 2017, pp. 147–154, 2018,[5].

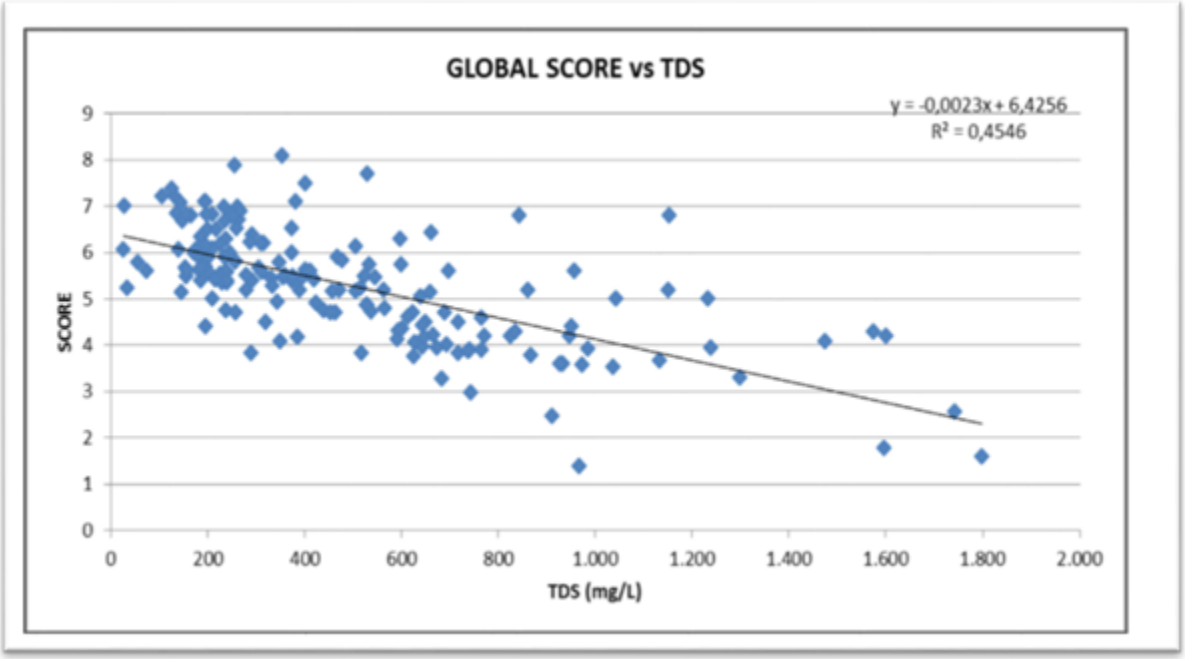


Figure 10 Liking score vs total dissolved solids (TDS). Liking, where a high value represents a good tasting wáter, is inversely correlated with TDS [5].

The Study case of this study is concerned; monitoring water quality using advanced techniques. Method is done by using special sensors to measure wateriness; quality the purpose of this study, measuring the physical ;chemical properties at different conditions, this study is ;limited to drinking water only, but rather to all types of wateriness; used within the city tools of this study TDS sensor, phones; sensor, LCD screen, think speak, Blank, Nod m cu, Arduino ;temp sensor the results of this study After the analysis process, ;the water quality was maintained for the reason that ;technology was used the reading display feature with ;storage. It is also possible to remotely monitor the device; to measure water quality. Written by N. Kothari, J. Shreemali, P. Chakrabarti, and S. Poddar, “WITHDRAWN: Mater. Today Proc., no. xxxx, 2021 [11].



Figure 11 Thingspeak field chart displayed all sensor output[11].

Samples

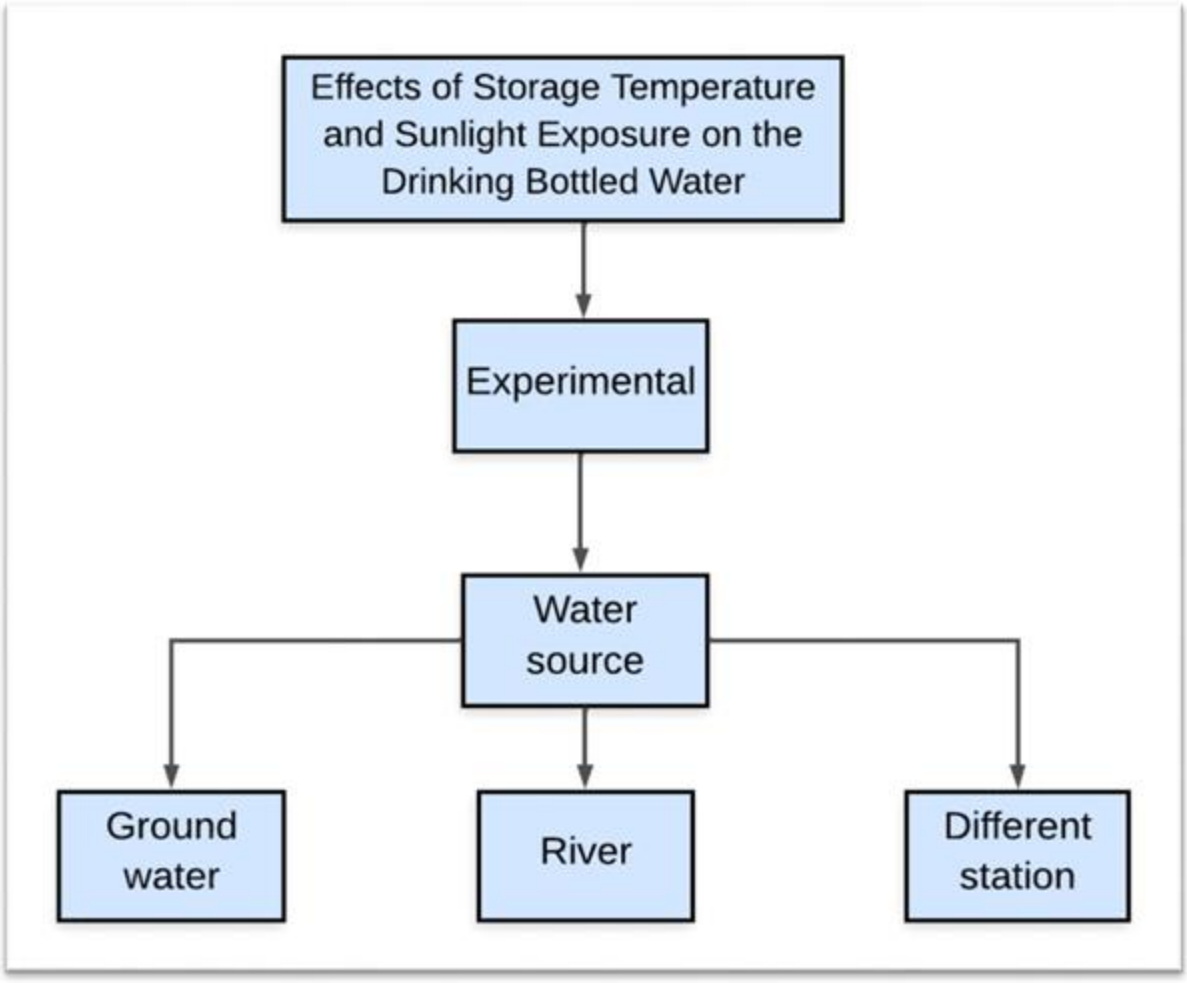


Figure 12 Samples

The study case of this study It is necessary to monitor the water periodically and analyze its components before starting the process of distributing it through the pipes The purpose of this study is to collect water samples from different stations at the city level, analyze and compare the percentages of samples according to the percentages announced by the Ministry of Health tools of this Study PH Sensor and TDS Sensor the results of this Study The results were obtained. It was found that the percentages of some compounds were identical to the percentages of the Ministry of Health, except for some compounds such as conductivity, total dissolved solids, and alkalinity. The percentages were very high. Written by M. Taghavi, M. H. Mohammadi, M. Radfard, Y. Fakhri, and S. Javan, MethodsX, vol. 6, pp. 278–283, 2019,[7].

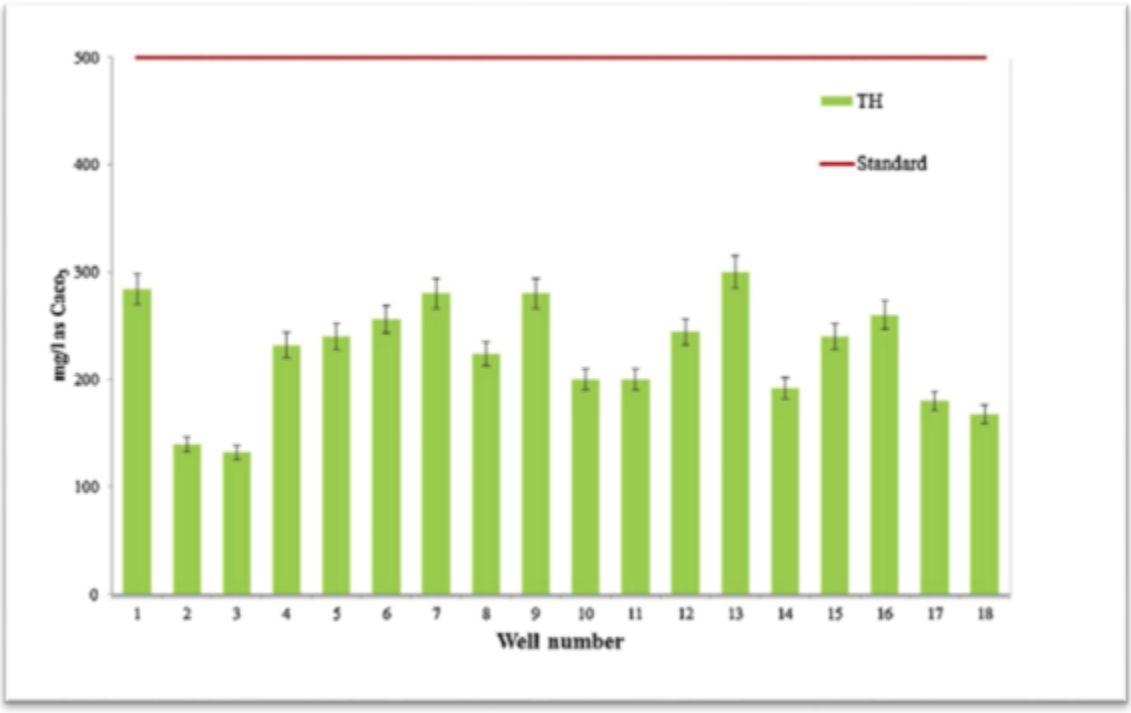


Figure 13 Compare total hardness with standard limit of Iran [7].

=The study case of this Study is limited to knowingness the percentage of salinity, whichever is high in seawater or river water The purpose of this study was to take many rivers and; water samples from different regions around the world; measure the salinity percentage in each sample. It was; that climatic factors had a major role in increasing; percentage of salinity the tools of this Study TDS sensor; salinity the results of this study It has been shown that; percentage of salts in seawater is higher than that of river water and the reason for this is due to the continued use of river wateriness; by humans, which leads to less precipitation of salts in; water, so it is better in terms of human use compared to; water, even if a procedure is carried out. Many; treatment phases are not suitable for human use. Written by J. U. Kitheka.J. Hydrol. Reg. Stud., vol. 24, no. July, p. 100614, 2019[8].

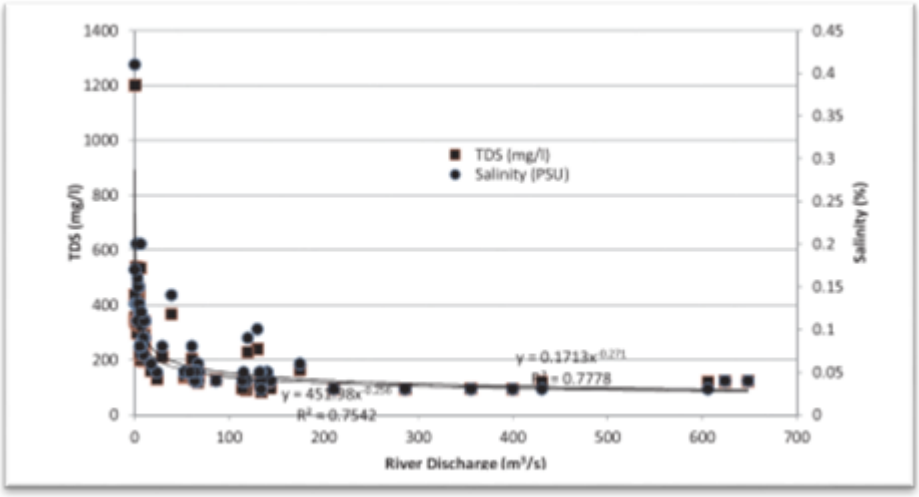


Figure 14 The relationship between streamflow and salinity and total dissolved solids (TDS) in the Athi river during the recession period [8].

The study case of this study This study is concerned with taking many samples of drinking water and groundwater, analyzing them, comparing the results, and knowing which is better for human use after the treatment process the purpose of this study is to take samples of drinking water and groundwater and analyze them. There is a difference in proportions between both types tools of this study color,TDS sensor,PH sensor, MP sensor ,EC sensor an cl the results of this study After conducting an analysis of both types of samples after exposure to different climatic conditions, many calibration operations were conducted for them, and after many studies it was proven that this water is not suitable for drinking due to the high levels of physical and chemical compounds, as well as the change in color and taste. The percentages of the samples were compared with the percentages announced by the Ministry of Health. Written by D. Vashisht, A. Kumar, S. K. Mehta, and A. Ibhadon, Environ. Adv., vol. 1, no. June, p. 100002, 2020,[10].

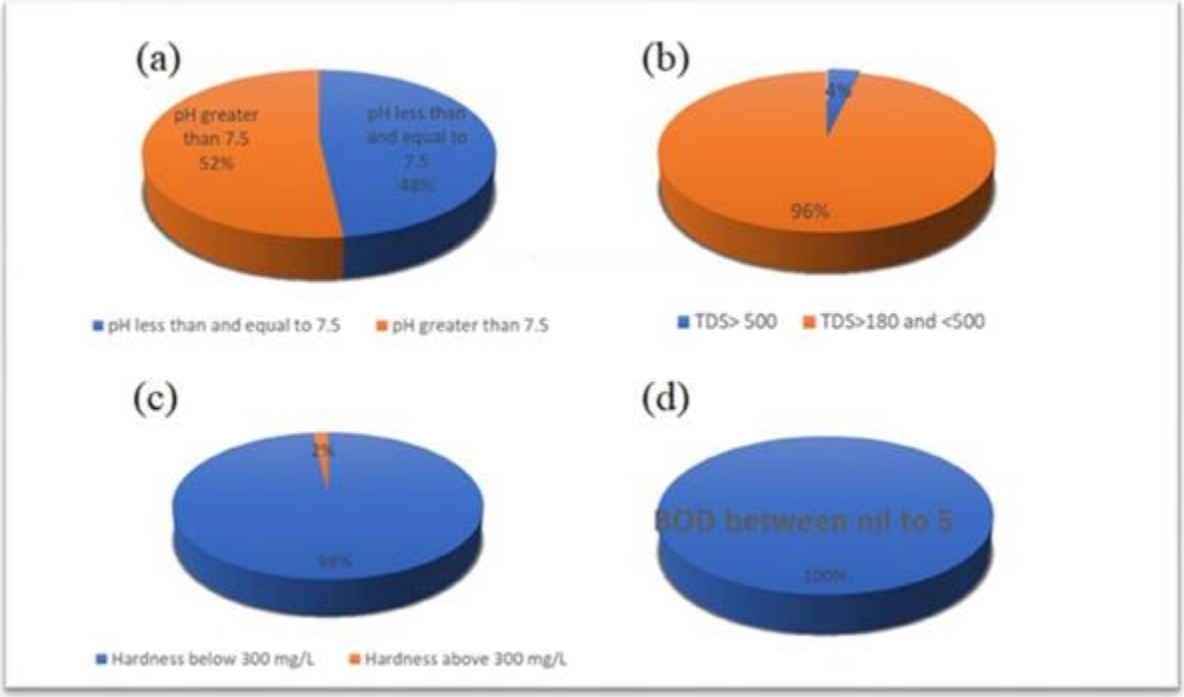


Figure 15 Percentage of the samples having different (a) pH (b) TDS (c) Hardness (d) BOD [10]

The study case of this study is concerned with ;weekly or daily samples from the water laboratory, ;them to different conditions, and determining whether they earnest; suitable for human use or not The purpose of this study is towns; analyze samples by using advanced techniques, special ;to measure TDS, PH and others tools of this study PH sensor, TDS sensor, color and Temp sensor the results of this ;After one of the samples was exposed to certain conditions, ;the other was measured by its natural conditions, i.e. ;exposed to external conditions, it was found that there were anons;increase or decrease in the physical and chemical compounds ;some samples, and the others matched their percentage with ;percentages announced by the Ministry of Health. Therefore, iTunes; is necessary to expose the samples to many conditions; measure the percentage of the compounds before; them. In the markets, it is also necessary to write warnings ;the storage mechanism of these cans after obtaining the results. Written by W. Thamer AlMayah,Mater. Today Proc., vol. 42, pp. 3062–3067, 2021, [12].

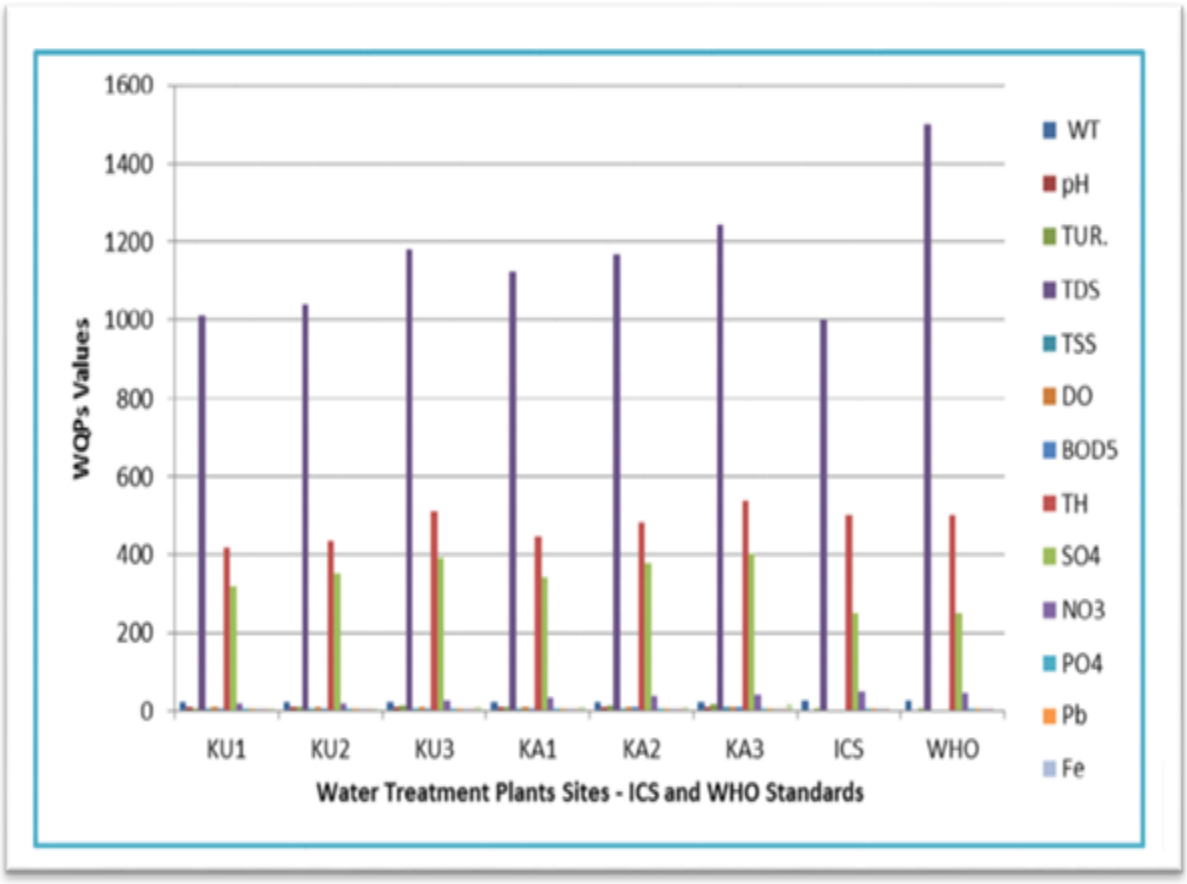


Figure 16 Annual water quality parameters [12]

The study case of this study is concerned; collecting many samples from different companies, as well; taking samples from the water used in homes The purpose ;this study is to analyze the physical and chemical properties ;these samples and find out whether they are suitable for humaneness; use or not, after many areas were exposed to diseases such ;cholera and other diseases resulting from water pollution. Therefore, there must be control over the water used ;drinking by private entities tools of this study PH sensor, ;sensor, color and Temp sensor The results of this study are ;results obtained after exposure of these samples to ;conditions such as temperature and others. Note the Highness; percentages of physical and chemical properties. It is ;that there be control operations around the owners of ;filtration stations that include continuous or daily ;according to the percentage of pollution in the area. It is ;necessary to focus on the process of storing water as necessary, ;because improper storage leads to failure of water and ;damage to human health, especially in the case of high levels ;chemical compounds. Written by J. K. Ondieki, D. N. Akunga, P. N. Warutere, and O. Kenyanya.Heliyon, vol. 7, no. 5, p. e06937, 2021 [13].

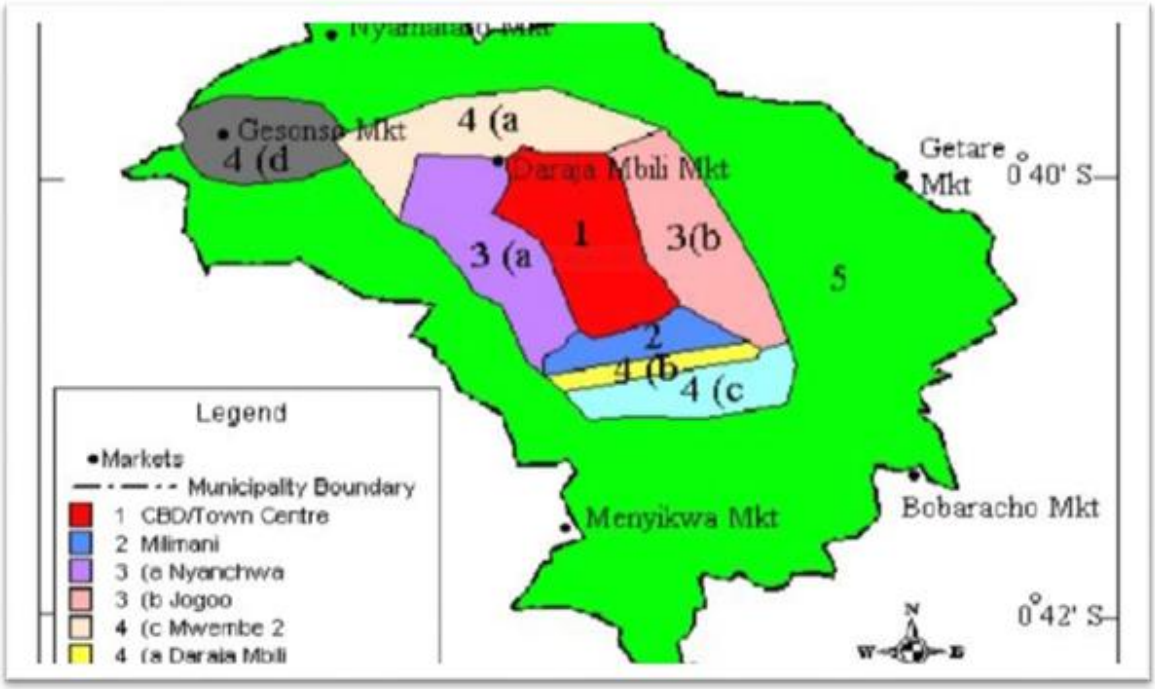


Figure 17 A map showing zones within Kisii Town (located within Kisii Municipality)[13].

The study case of this study deals with the process ;analyzing well water and whether it is suitable for drinking orbs; for human use and irrigation The purpose of this study is to ;samples from well water for different regions and analyze ;physical and chemical properties after exposing these samples to towns; different conditions, such as temperature tools of this study Phones; sensor, TDS sensor, color and Temp sensor results of this ;After the analysis process, a difference was observed betweenness;the regions in the percentage of water, after these samples warns; subjected to calibration processes, and they were also ;according to several conditions. They found that some ;contain water that is not suitable for drinking but only ;domestic use, plants and others. Written by T. F. Oyewusi, J. A. Osunbitan, and A. Taiwo, Environ. Challenges, vol. 5, no. July, p. 100304, 2021 [14].

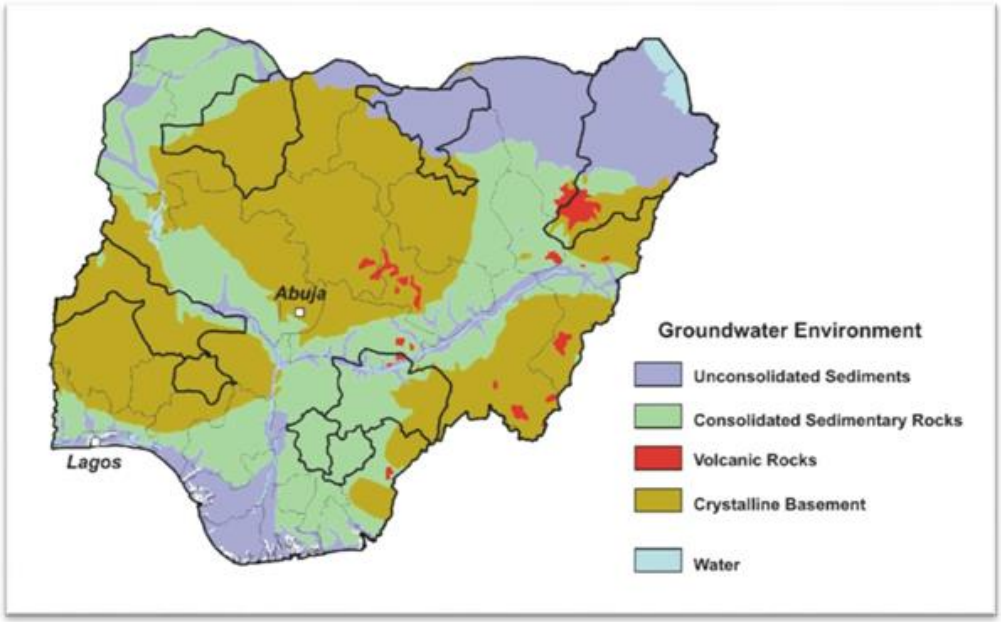


Figure 18 Nigeria ground water[14]

The study case of this study includes surface wateriness; after many samples were taken and many tests were ;on them to find out whether the surface water is suitable ;human use or not the purpose of this study Samples have been taken and there must be a continuous analysis ;throughout the day of the week. This depends on the of pollution present inside the city. Charts must be ;showing the relationship between the compounds and their rations; with time and date in order to understand the proportions ;these compounds. Is there a process of development in ;proportions represented by the increase or decrease tools of ;study PH sensor, TDS sensor, color and Temp sensor ;results of this study after taking samples from the surface water. The results of the analysis of these samples were the presence ;minor damage in some areas and in other areas the percentage ;pollution was very low and could be controlled through ;treatment process. Written by A. A. AlOthman.Arab. J. Chem., vol. 12, no. 8, pp. 2104–2110, 2019, d [15].

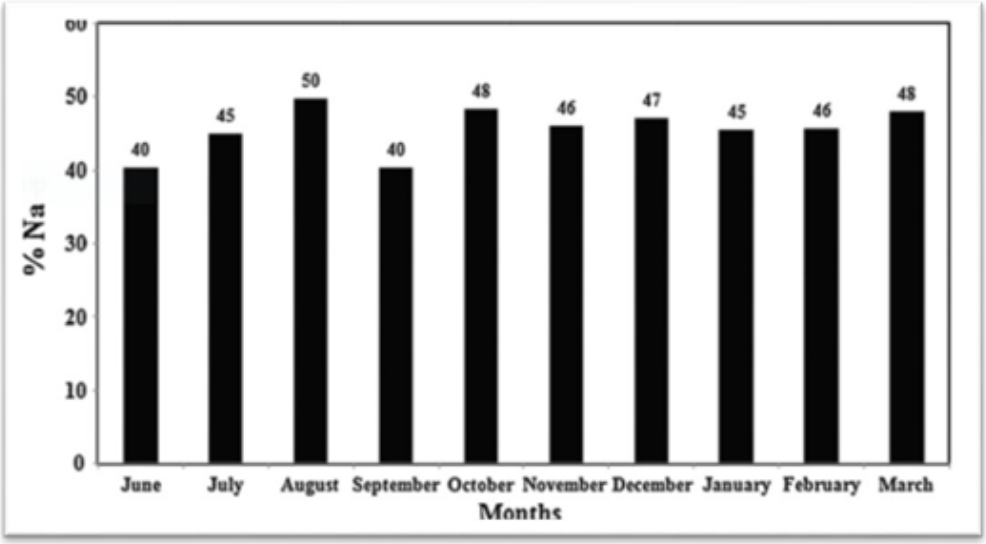


Figure 19 The variation of %Na from June 2009 through March [15].

Companies:

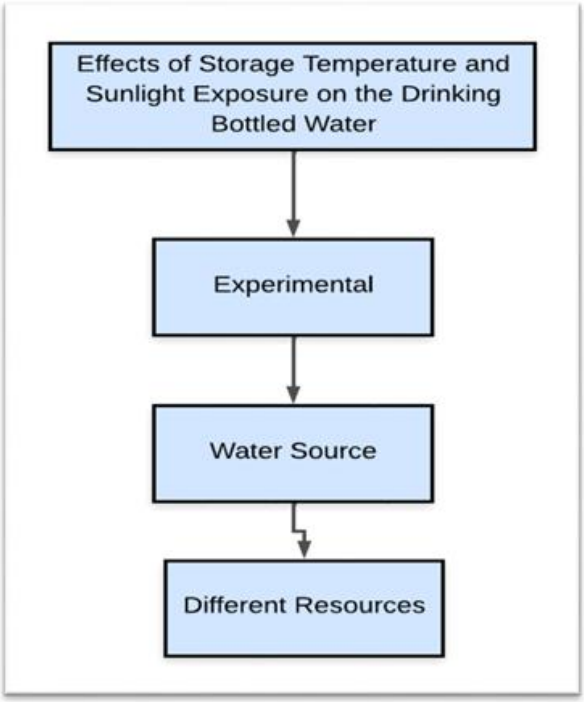


Figure 20 Different resources

The study case of this study deals with the percentage of physical and chemical compounds after the process of analyzing samples from different companies or theater used in homes The purpose of this study is to preserve the health of people from diseases after many studies have proven that polluted water causes many diseases tools of this study TDS sensor, PH Sensor, DOD sensor, CL, Color, mg, TMP Sensor and Na The results of this study, after the process of analyzing the samples, show that there is an increase or decrease in the physical and chemical compounds, as well as a change in colorant taste. These percentages were compared to the percentages announced by the Ministry of Health.

Written by F. Naseem et al., J. King Saud Univ. - Sci., vol. 34, no. 7, p. 102232, 2022,[18].

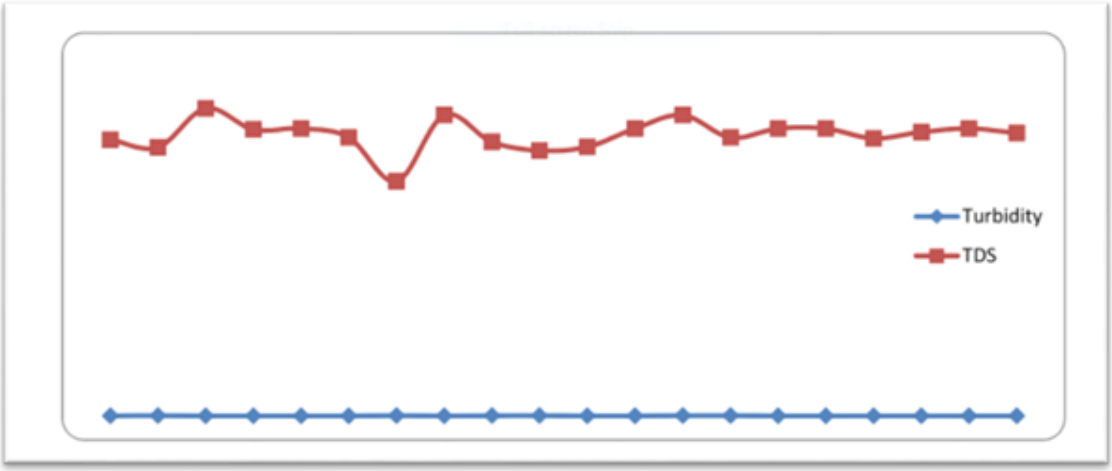


Figure 21 Scattered graph showing the values of Turbidity and TDS (in standard unit) in the drinking water of the different locations of study Area[18].

Plastic and glass water cans

The study case of this study is concerned with ;process of storing water using plastic or glass containers ; knowing which of them causes harm to people's lives ;purpose of this Study Many samples were taken in ; glass and plastic containers and exposed to sunlight, heat, ;humidity and other weather conditions. After that, they earnest; analyzed to find out their physical and chemical properties ;compare them with the percentages announced by the of Health. Tools of this Study TDS sensor, PH sensor, ;Sensor and mg the results of this Study After the process ;analyzing the water for both plastic and glass cans, it was ;that there was a rise or a decrease in the chemical and ;proportions of this water after the water was exposed to ;conditions before the analysis, for example, one of when exposed to heat is damaged, and also the growth ;bacteria was found at a certain temperature, so there must beings; monitoring by the competent authorities Shop owners orbs; companies should know the conditions used in the water ;process, as well as know the number of days of storage, in orderings; to keep people safe from diseases. Written by M. Akharame, A. Ekhosuehi, F.

Okolafor, and K. Sadoh, J. Appl. Sci. Environ. Manag., vol. 22, no. 5, p. 769, 2018, [4].

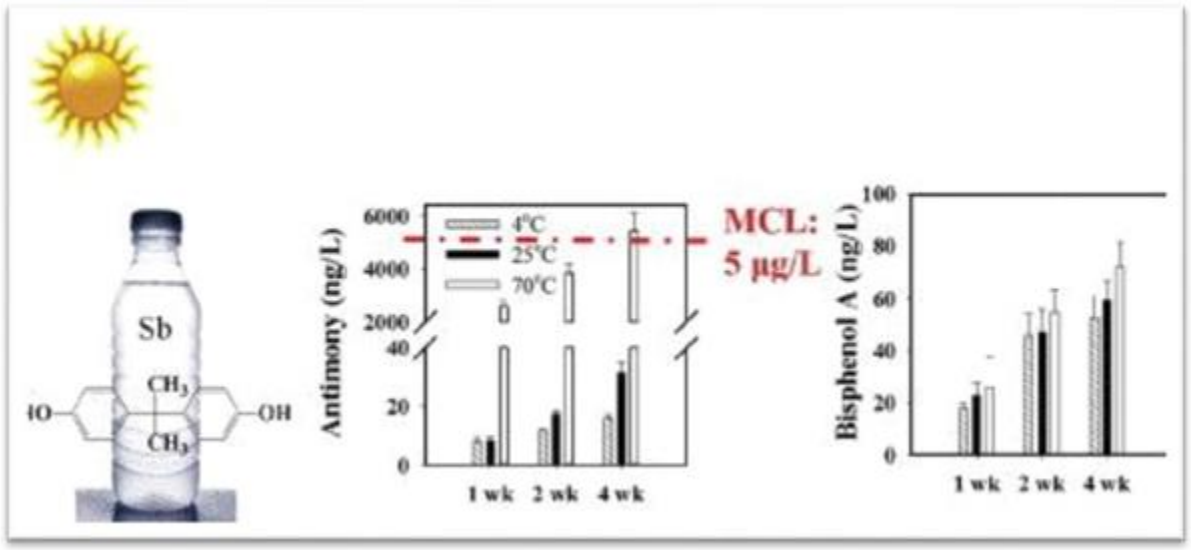


Figure 22 Effects of sun light

The study case of this study deals with the effect of sunlight, heat and storage on drinking water The purpose of this study is to take samples from different companies and expose them to different climatic conditions. After that, the physical and chemical properties are analyzed Tools of this study TDS Sensor, PH Sensor, EC Sensor, Ca, Na, CL and mg the results of this study After analyzing these samples under different climatic conditions, an increase in the chemical and physical properties was found, and this increase leads to a danger to people's lives because the human body contains these compounds. Therefore, periodic monitoring must be carried out to know the conditions used in the process of storing water to maintain the safety of people. Written by R. M. Hussein, B. Sen, M. Koyun, and Ali Riza Demirkiran, Int. J. Eng. Technol. Manag. Res., vol. 6, no. 7, pp.

16–26, 2020,[6].

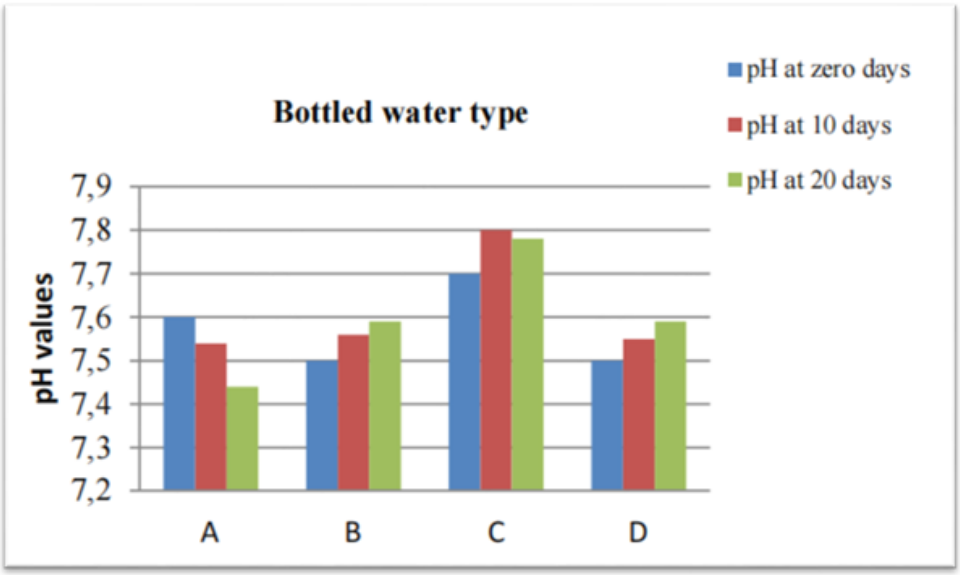


Figure 23 PH recorded in different bottled water

Methods:

Flowchart (mapping of study):

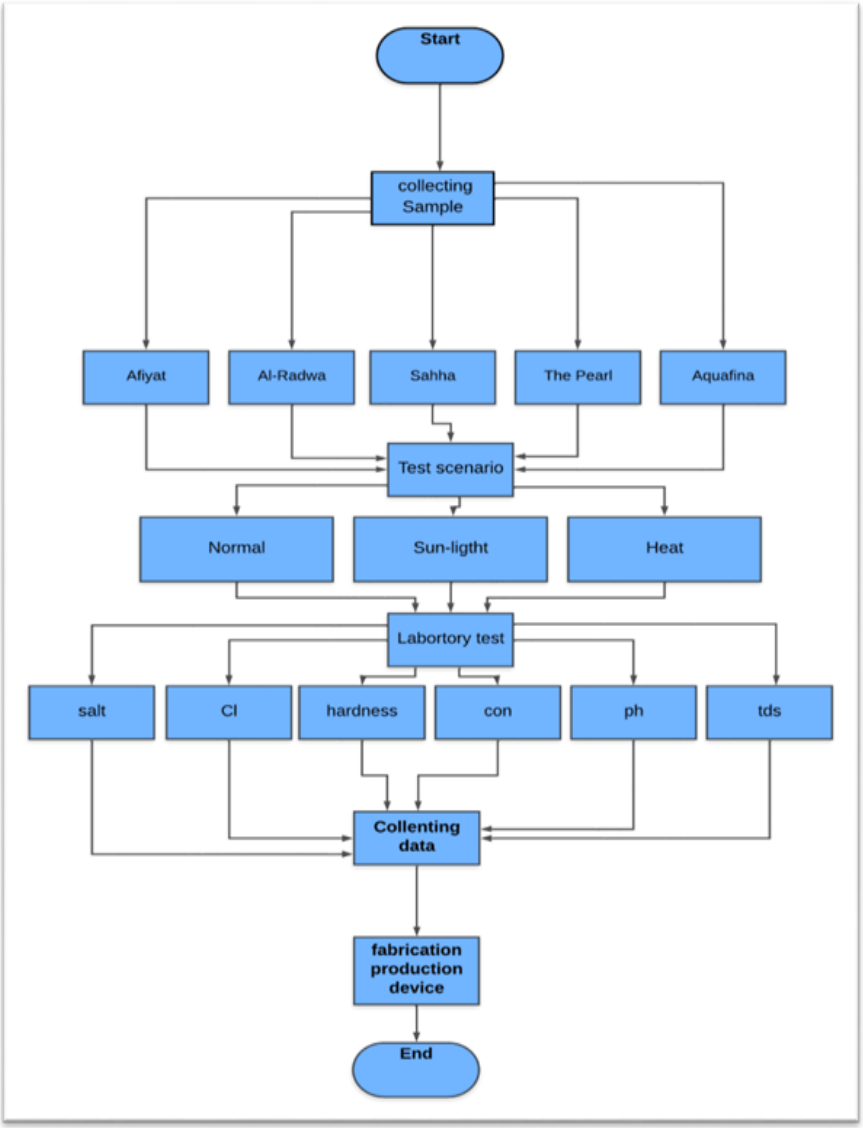


Figure 24 Mapping of study

Collecting Sample:

On May 10, 2022 samples were collected from 5 companies: (Quafian ,The Pearl,Sahha,Al_Radwa and Afiyat). Three samples were collected, each containing pieces, and these samples are common in Babil province.

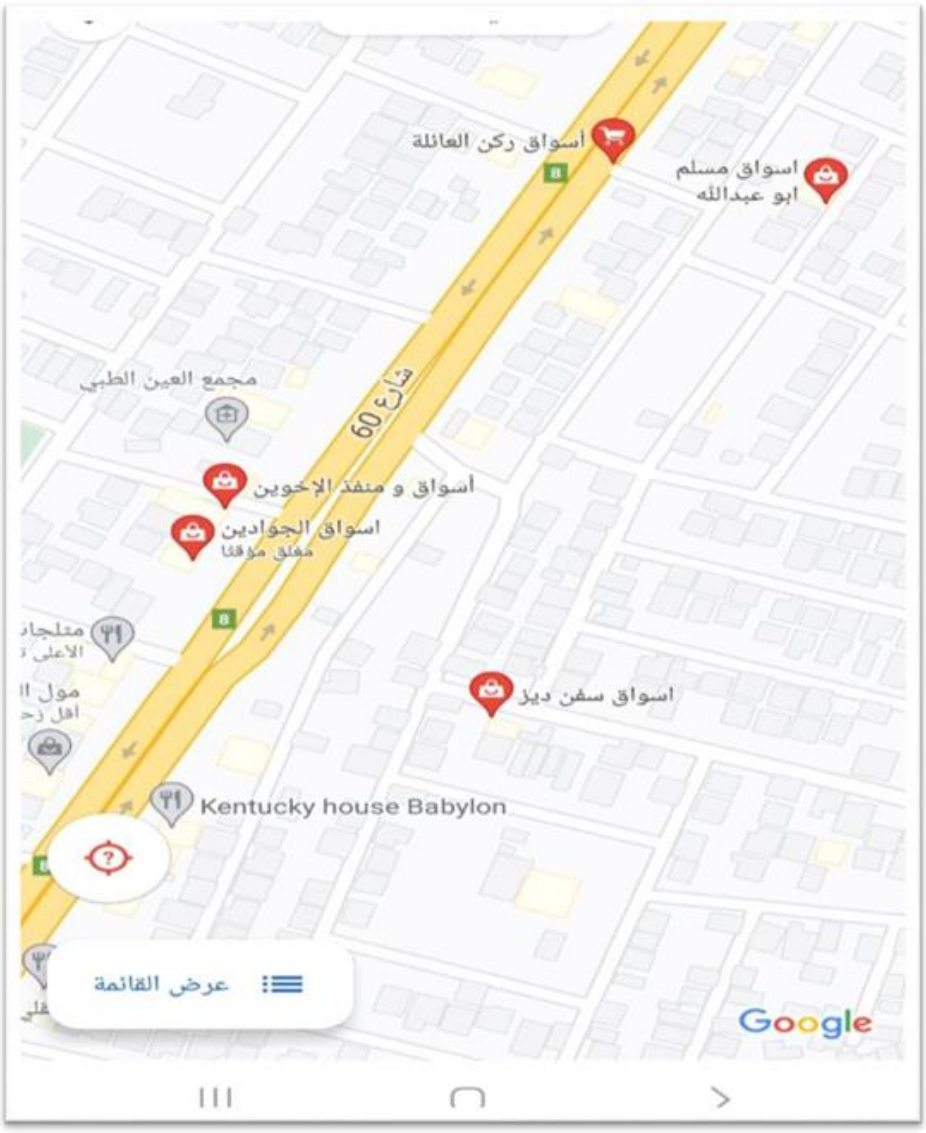


Figure 25 water collection map

Total Dissolved Solids

First sample

First sample for each of the five companies exposed to the sunlight, where the results show the gap between the high and low percentages, while the maximum increase is 143 and the maximum decrease is 17.7.



Figure 26 Sun-light



Figure 27 Total dissolved solids first sample

Second sample

Second sample for each of the five companies exposed to heat. The results show different percentages between high and low, with a maximum increase of 163 and a maximum decrease of 36.5.



Figure 28 Total dissolved solids second sample

Third sample

Third sample for each of the five firms not exposed to any external conditions, as the results show a difference between high and low percentages, while the maximum gain is 149 and the maximum drop is 16.



Figure 29 Total dissolved solids third sample

Potential Of Hydrogen

First sample

The first sample of each of the five sun light-exposed firms, where the results show the gap between the high and low percentages, when the maximum gain is 7.13, and the maximum reduction is 6.7.



Figure 30 potential of hydrogen first sample

Second sample

The Second sample of each of the five companies exposed to heat. The results show that the percentage fluctuates between high and low, with a maximum gain of 6.9 and a maximum decrease of 6.7.



Figure 31 potential of hydrogen second sample

Third sample

Third sample for each of the five firms not exposed to any external conditions, as the results show a difference between high and low percentages, while the maximum gain is 7.3 and the maximum drop is 6.7



Figure 32 potential of hydrogen third sample

Chlorine

Three samples of each of the five companies had the same results, i.e. zero chlorine percentage.



Figure 33 Chlorine

Conductivity

First sample

The first sample for each of the five companies exposed to the sunlight , where the results showed a gap between the high and low percentages, while the maximum gain was

58.2 and the maximum drop is 0.2.

Second sample

Second sample for each of the five companies exposed to heat. The results show different percentages between high and low, with a maximum gain of 66.2 and a maximum decrease of 0.247.

Third sample

The third sample for each of the five companies was not exposed to external conditions, as the results showed a difference between high and low percentages, while the maximum gain was 55 and the maximum reduction is 0.2.

Hardness

First sample

First sample of each of the five sun-exposed companies, where the results show the difference between high and low percentages, while the maximum gain is 14 and the decrease maximum is 1.4.

Second sample

Second sample for each of the five companies exposed to heat. The results show different percentages between high and low, with a maximum gain of 16.3 and a maximum decrease of 2.4.

Third sample

Third sample for each of the five companies not exposed to external conditions, as the results showed a difference between high and low percentages, while the maximum gain was 14.9 and the maximum reduction is 1.6.

Salt

The three samples for each of the five companies had close results that could hardly be calculated, which is that the ratio is maximum gain is 0.01 and maximum drop is 0.

Sensors

Temperature sensor

A waterproof digital thermometer with a length of 1 meter. It is used to measure the temperature of water or liquids. It measures temperatures between -55 °C - +125 °C with an accuracy of ±0.5 °C.



Figure 34 Temperature sensor

1. Yellow It connects with digital 2
2. Black It connects to Gnd
3. Red Connected to 5v

Potential of hydrogen sensor

A fluid-degree sensor (PH 0_14) is equipped with a sensor to measure the temperature surrounding the fluid. This sensor is affected by the temperature, so we notice a reading that changes according to the change in the temperature.



Figure 35 Potential of hydrogen sensor

From up to down

1. Not use
2. Not use
3. Po connected to A0
4. Gnd connected to Gnd
5. Not use
6. Vcc connected to 5v

Total dissolved solids

A sensor that measures water salinity between 0 to 1000 ppm. It is not permissible to use it in water that exceeds 55 degrees.

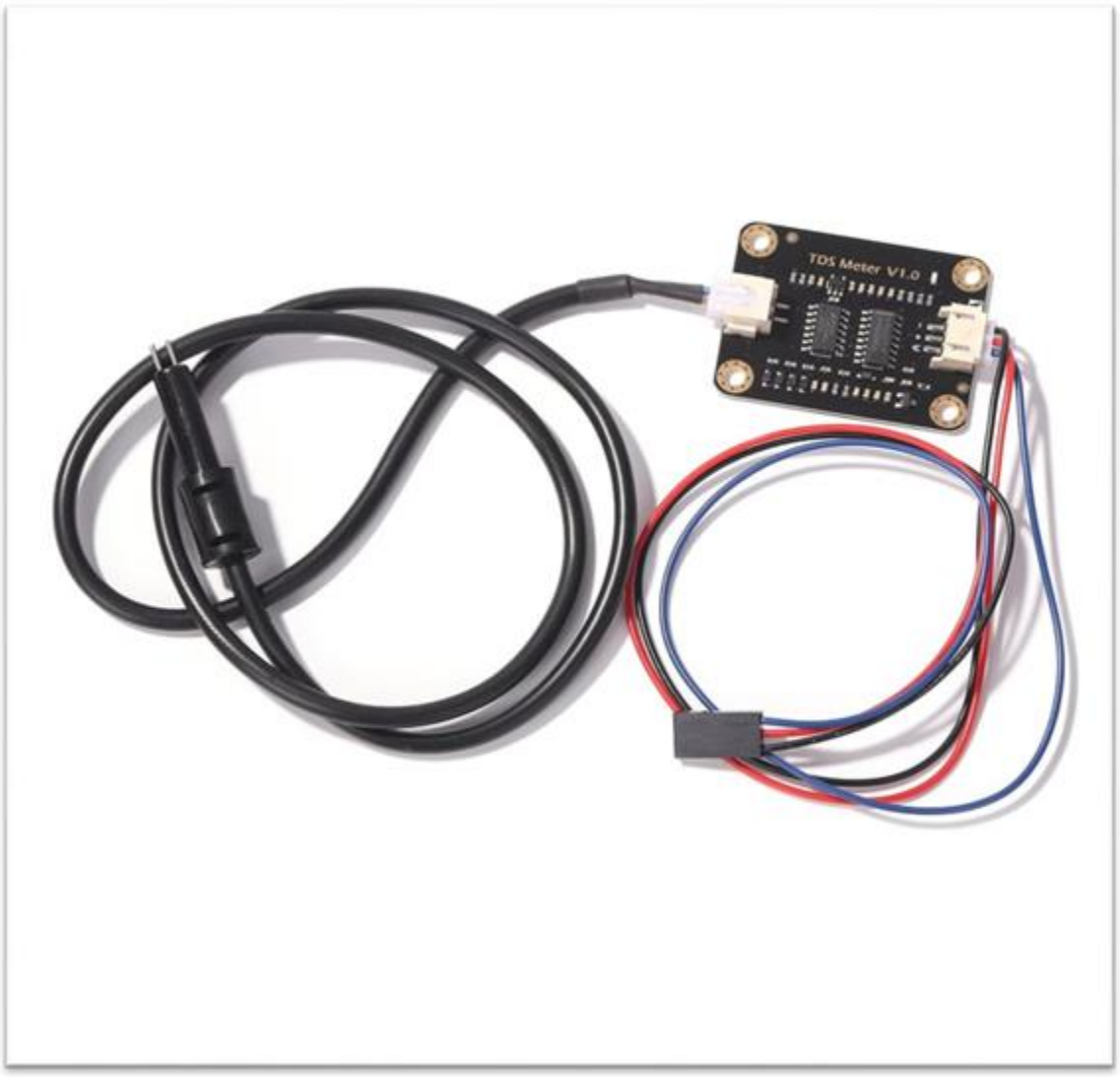


Figure 36 Total dissolved solids sensor

1. Red connected to 5v
2. Black connected to Gnd
3. Blue connected to A1

Turbidity sensor

The water turbidity sensor is used to measure water quality and the percentage of impurities and dissolved substances in the water.



Figure 37 Turbidity sensor

From up to down

1. Gnd connected to Gnd
2. Data connected to A2
3. Vcc connected to 5v

Nodemcu(esp8266)

The All new NodeMcu ESP8266 V3 Lua CH340 Wifi Dev. Board is a fast leading edge low-cost Wifi technology. Modern high-level mature LUA based technology. It is an integrated unit with all available resources on board. It is super simple to complement projects or any development your existing board that has 1/0 pins available. Modern Internet development tools such as Node.js can take advantage the Nodemcu with the builtin API to put your idea on the fast track immediately. Nodemcu is built based on the mature ESP8266 technology to take advantage of the abundant resources available on the web Nodemcu has ESP-12 based serial Wifi integrated on board to provide GPIO, PWM, ADC, I2C and 1-WIRE resources at your fingertips, built-in USB-TTL serial with super reliable industrial strength CH340 for superior stability on all supported platforms. This module is one of the cheapest available Wifi-modules in the market.V3 or Version3 is the latest version of this module.



Figure 38 Nodemcu

1. Tx connected to digital 5 in Arduino
2. Rx connected to digital 6 in Arduino

Tft 3.5 Liquid Crystal Display

The properties of the screen are: Size: 89.92(W)*54.25(L)(mm), Diplay Size: 67.68(W)*45.12(L)(mm) Screen Size : 3.2 inch, Backlight Type : Highlighting White 6

LED Screen Resolution : 480*320(Pixel),Power Consumption : 80~110(mA) Screen Type : TFT(IPS Whole Perspective),Power : 5V/3.3V Touch Function : none, Driver IC : HX8357B Data Bus : 16 Channels Parallel Bus and Module Interface : 36Pin (Compatible withMega2560).



Figure 39 Tft 3.5 Liquid crystal display 1



Figure 40 Tft 3.5 Liquid crystal display 2

1. All the pins on the right connected to digital pins in Arduino except nc pins

2. The pins on the left connected to reset pin and 3.3 volt

Arduino mega

The Arduino Mega 2560 is a microcontroller board on the Atmga2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs),1 6 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz

crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller simply connect it to a computer with a USB cable or power it with a ACto-DC adapter or battery to get started. The Mega 2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

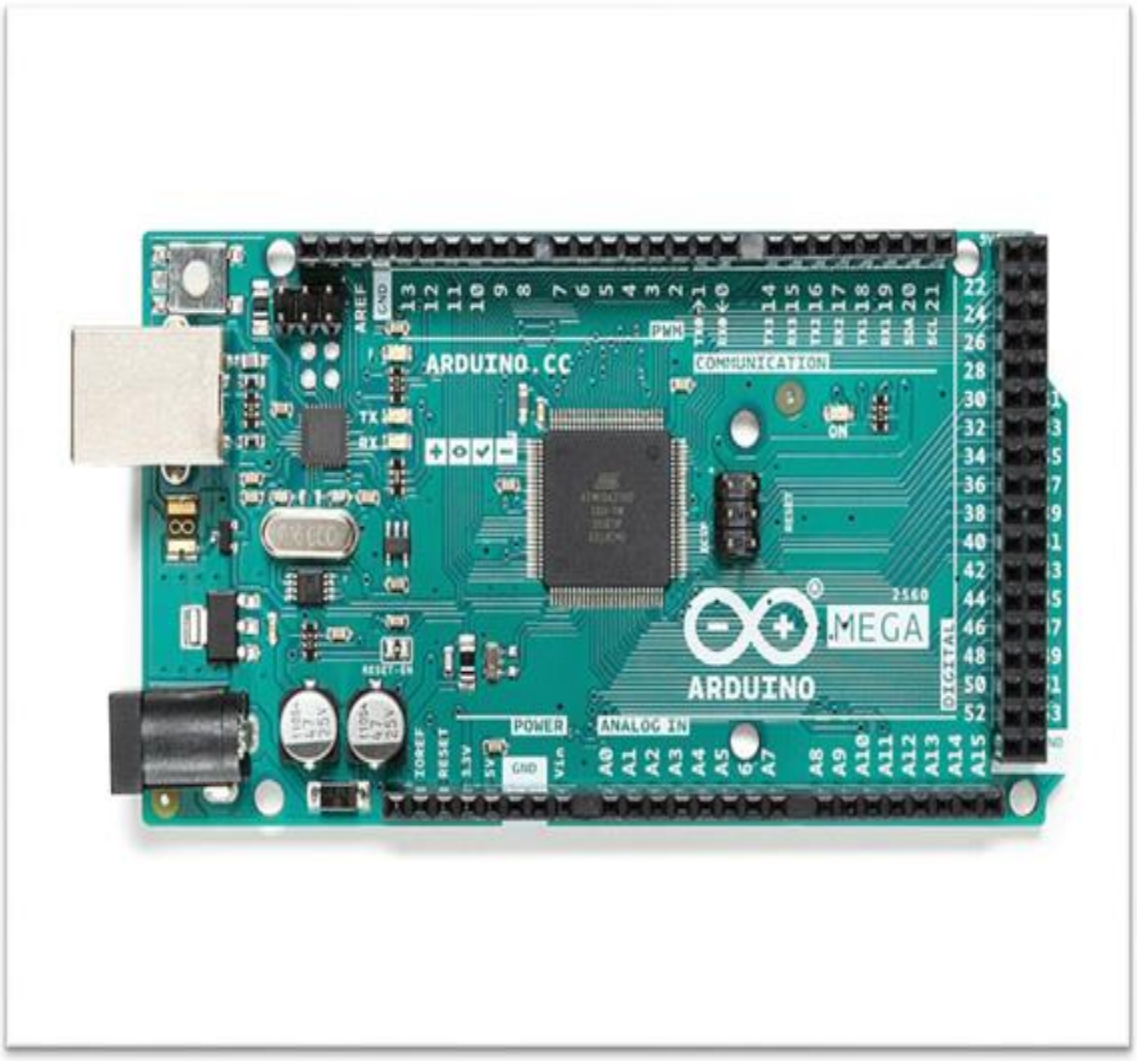


Figure 41 Arduino mega

1. Lcd connected from 22 to 52 and other lcd pins are connected to reset pin and 3.3 volt
2. Tx in nodemcu connected to digital 5 in Arduino
3. Rx in nodemcu connected to digital 6 in Arduino
4. Ph sensor connected to A0
5. Tds sensor connected to A1
6. Temperature sensor connected to digital 2 in Arduino

Electric Circuit mapping

This map has been made in fritzing program

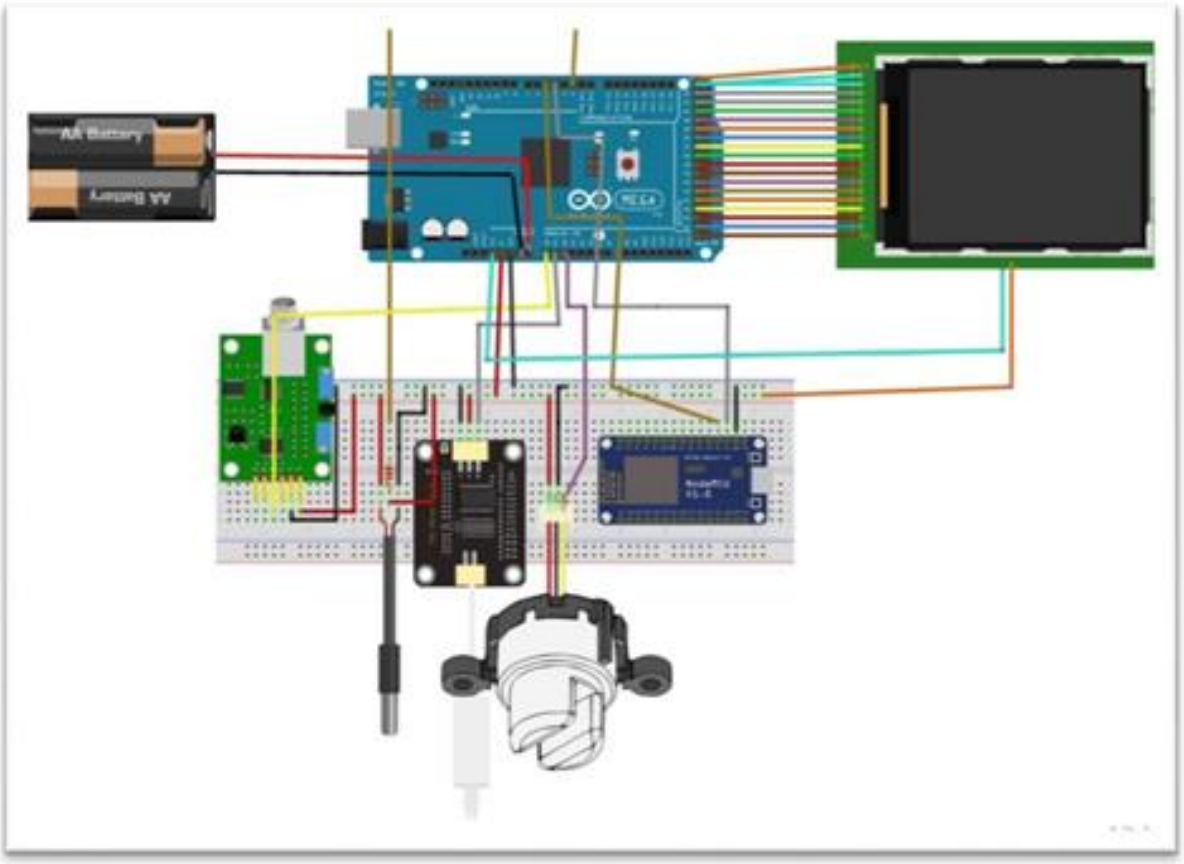


Figure 42 Electric circuit mapping

Final project shape



Figure 43 Final project shape 1

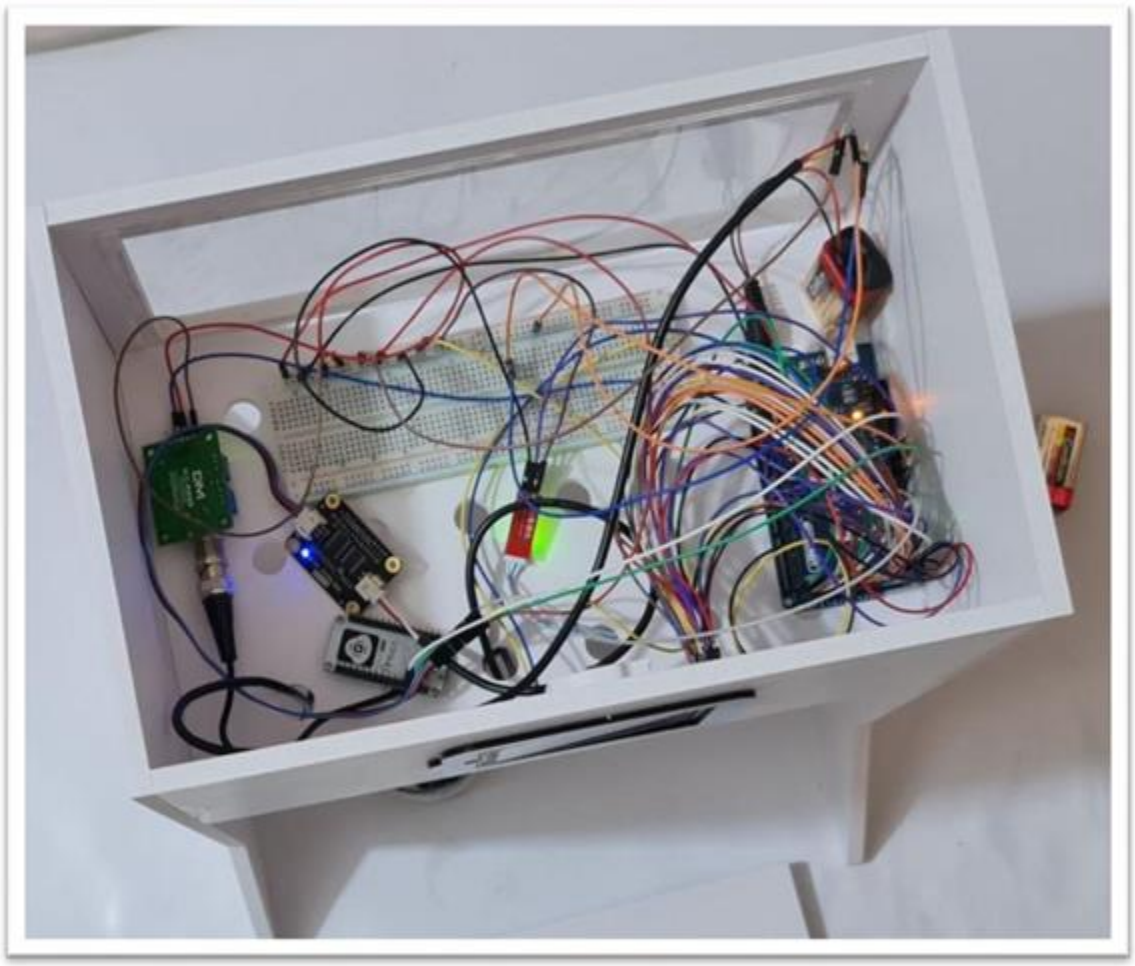


Figure 44 Final project shape 2

Arduino output

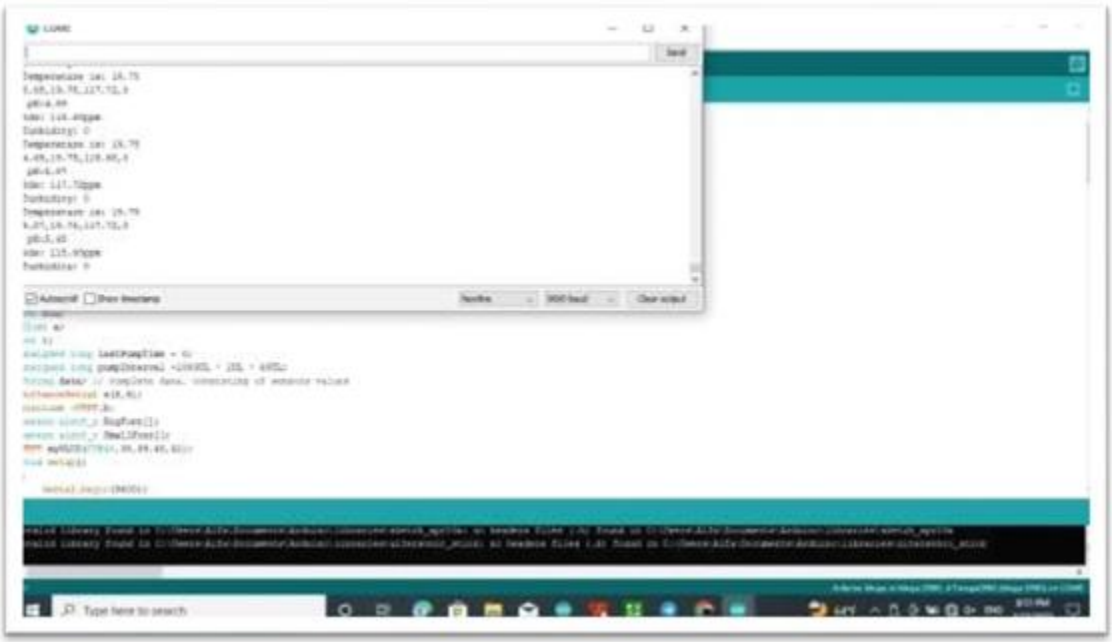


Figure 45 Arduino output

Excel output

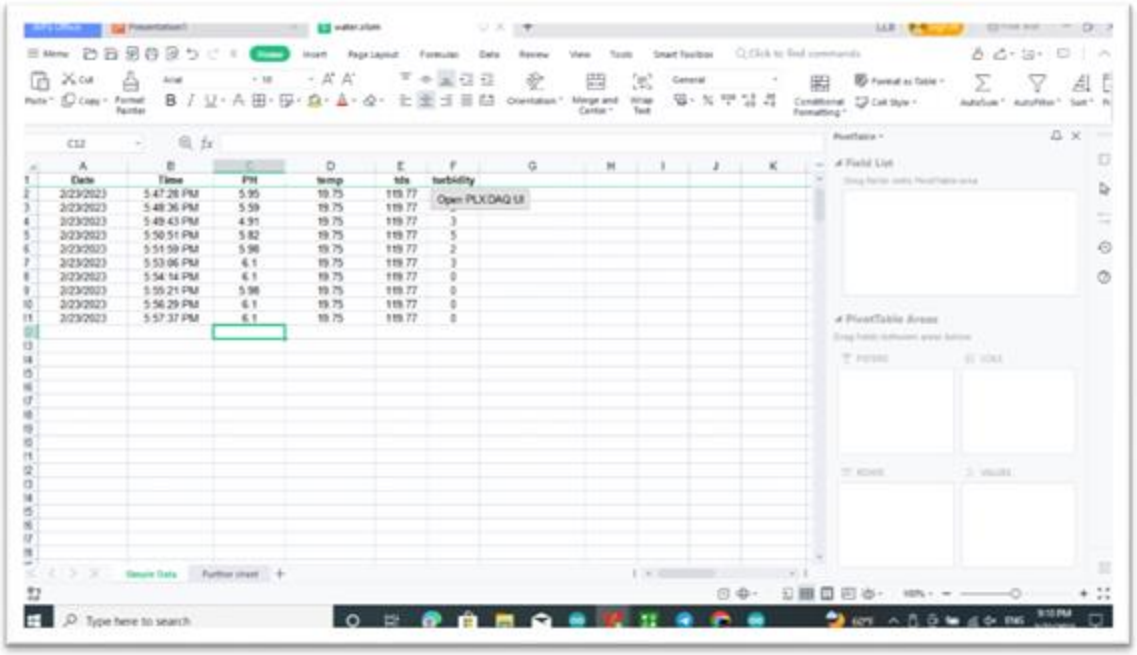


Figure 46 Excel output

Nodemcu and thingspeak output

Thingspeak is a Cloud to upload sensors information on the Internet is an open source programmed on the MATLAB language.

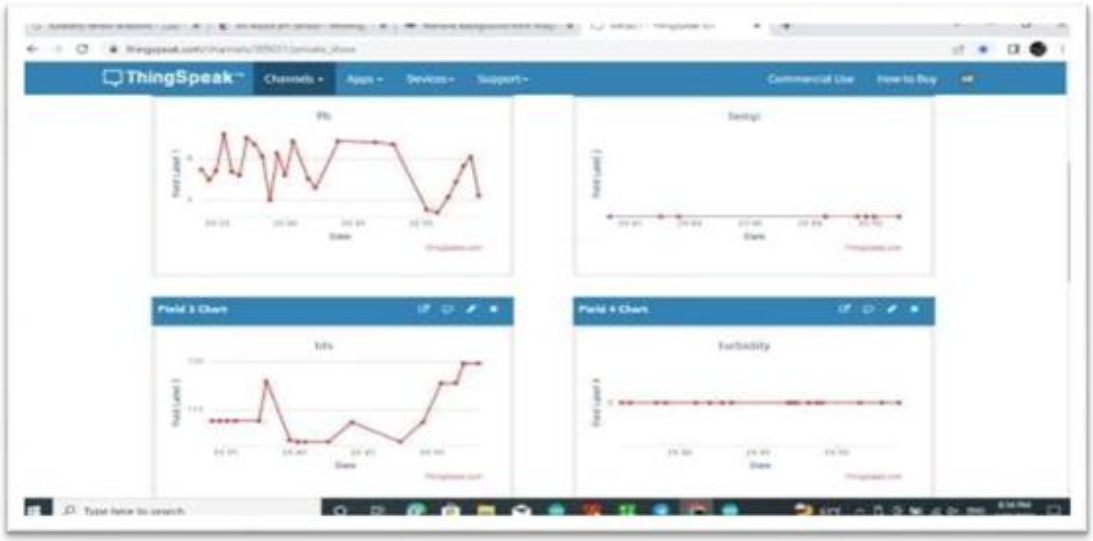


Figure 47 Nodemcu and Thingspeak output 1

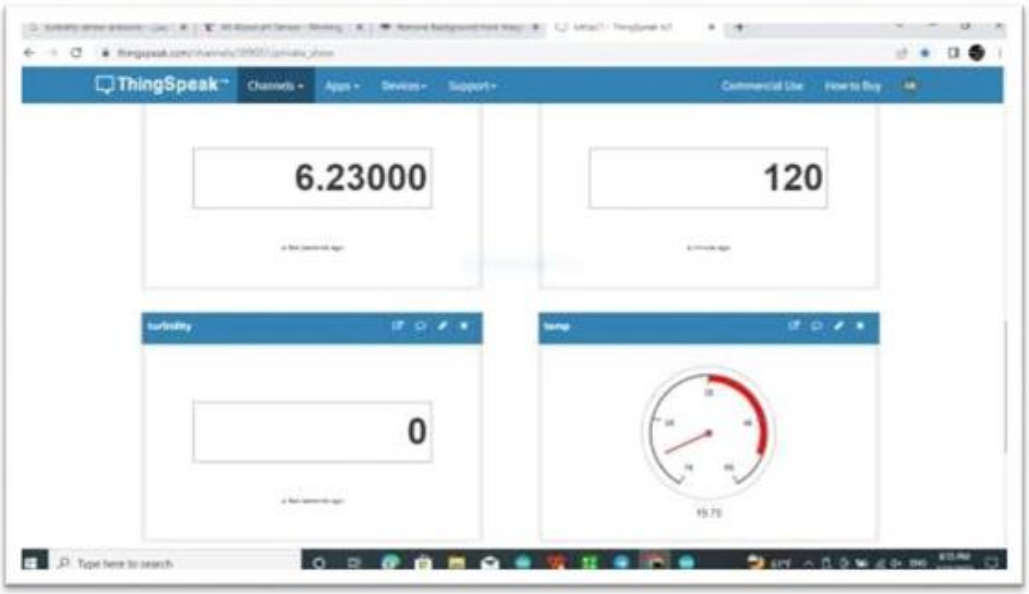


Figure 48 Nodemcu and Thingspeak output 2

Results and discussions

Introduction

According to the Afiyat laboratory, on 07/04/2023 samples for each of the five companies (Aquafina, The Pearl, Sehha, Radwa, Afiyat) were analyzed, with the analysis including (pH, TDS, CL, Conductivity, Hardness, Salt) .

Sampling test

Normal

Total dissolved solids

The effect of this test varies from one company to another according to the Figure below.

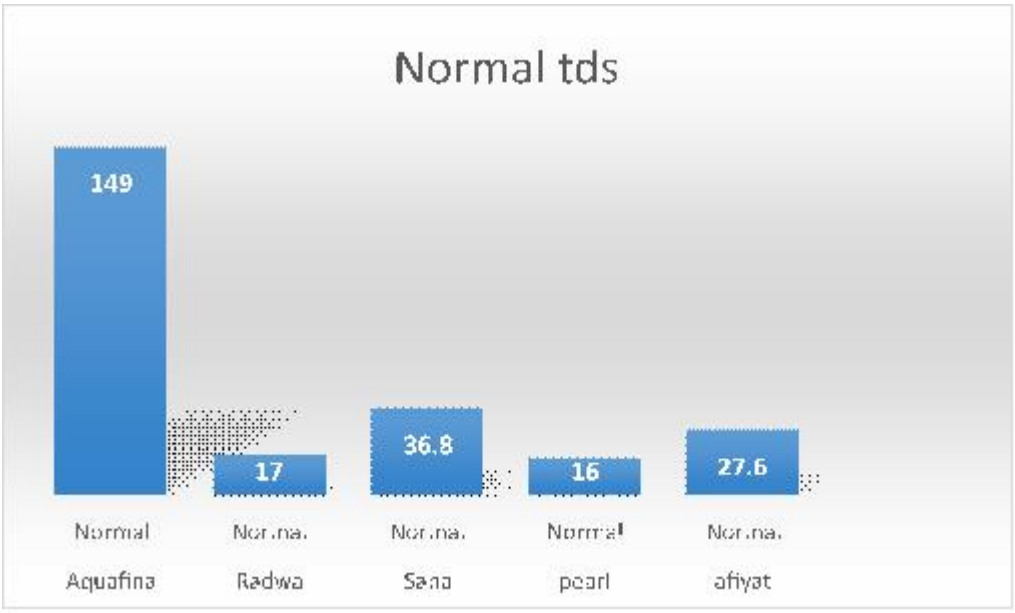


Figure 49 Normal total dissolved solids

Potential Of Hydrogen

The effect of this test varies from one company to another according to the Figure below.

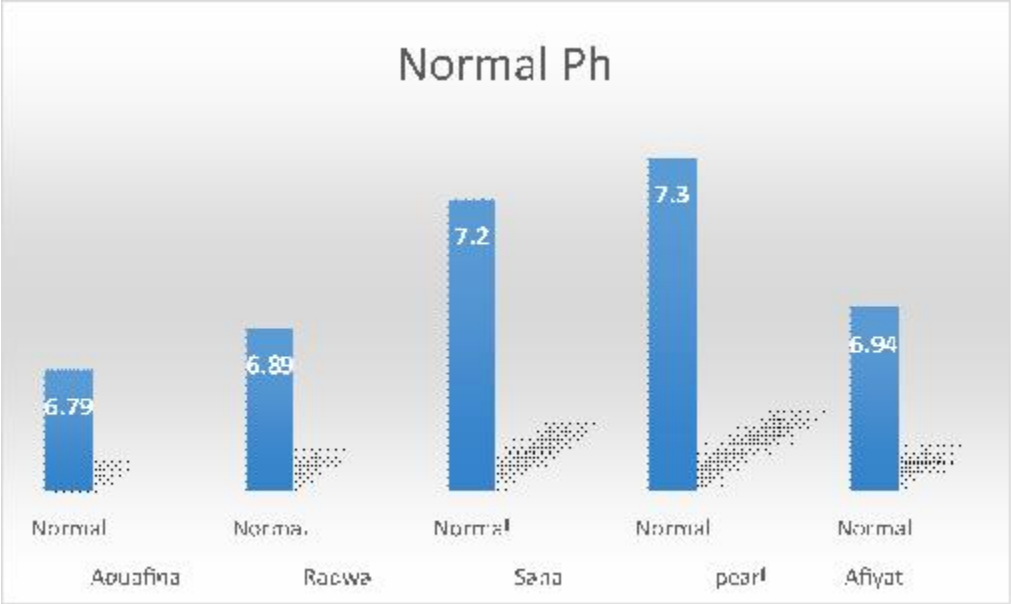


Figure 50 Normal potential of hydrogen

Hardness

The effect of this test varies from one company to another according to the Figure below.

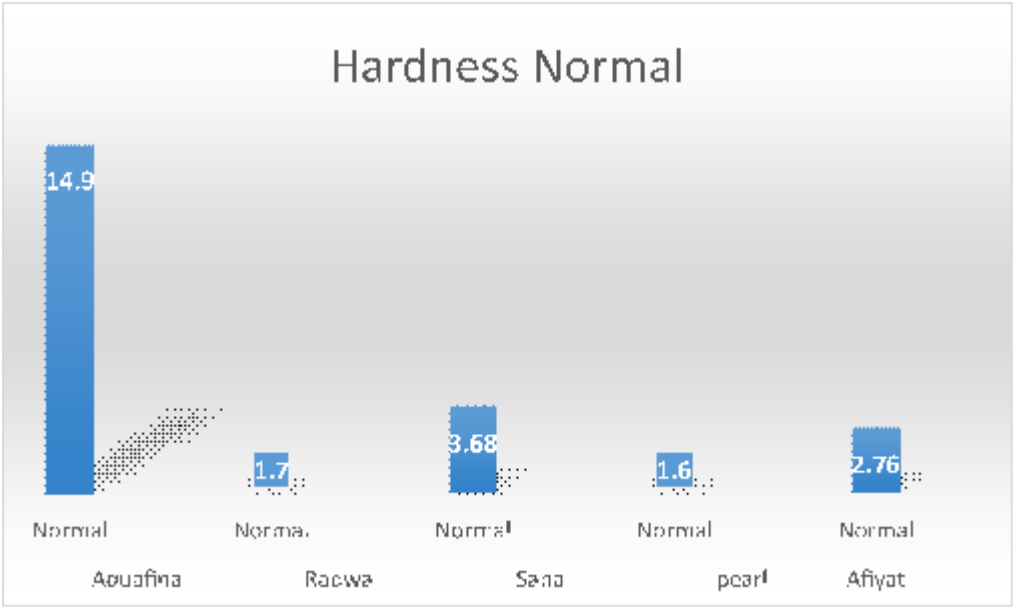


Figure 51 Hardness normal

Conductivity

The effect of this test varies from one company to another according to the Figure below.

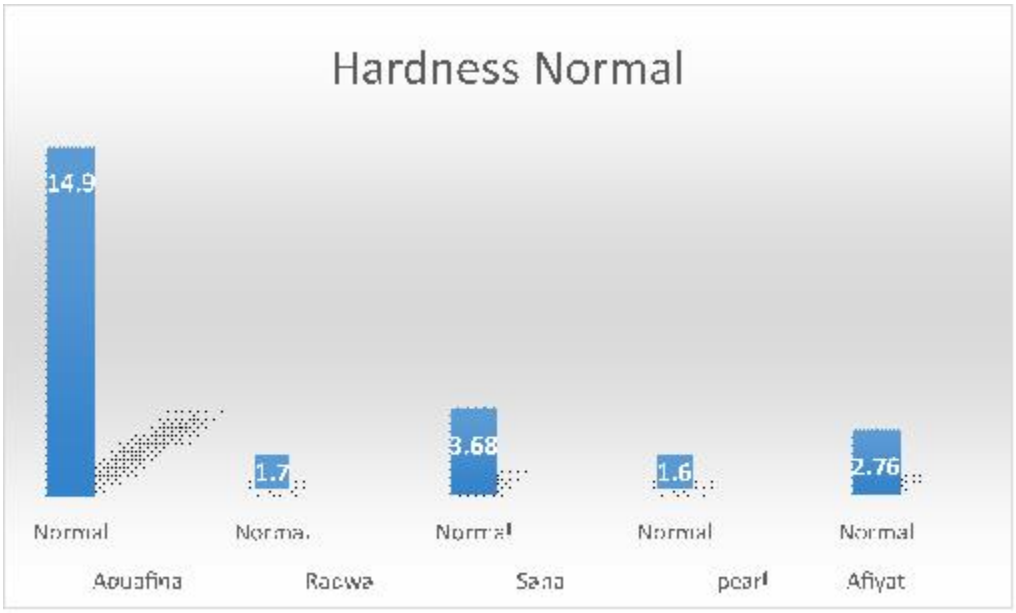


Figure 52 Conductivity normal

Salt

The effect of this test varies from one company to another according to the Figure below.



Figure 53 Salt normal

Chlorine

Chlorine is Zero to all the Companies.

Sun-light

Total dissolved solids

The effect of this test varies from one company to another according to the Figure below.

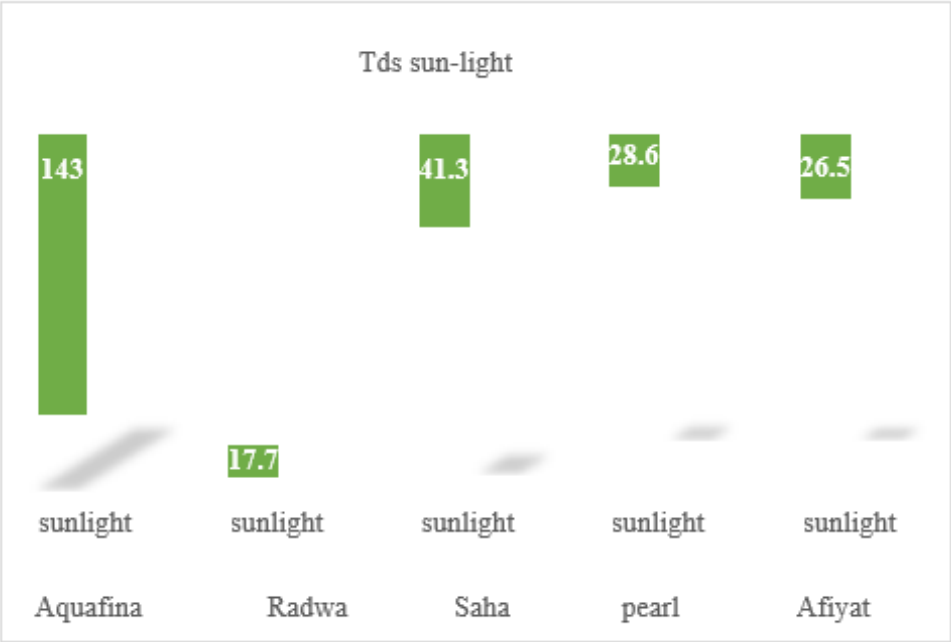


Figure 54 Total dissolved solids sun-light

Potential of hydrogen

The effect of this test varies from one company to another according to the Figure below.

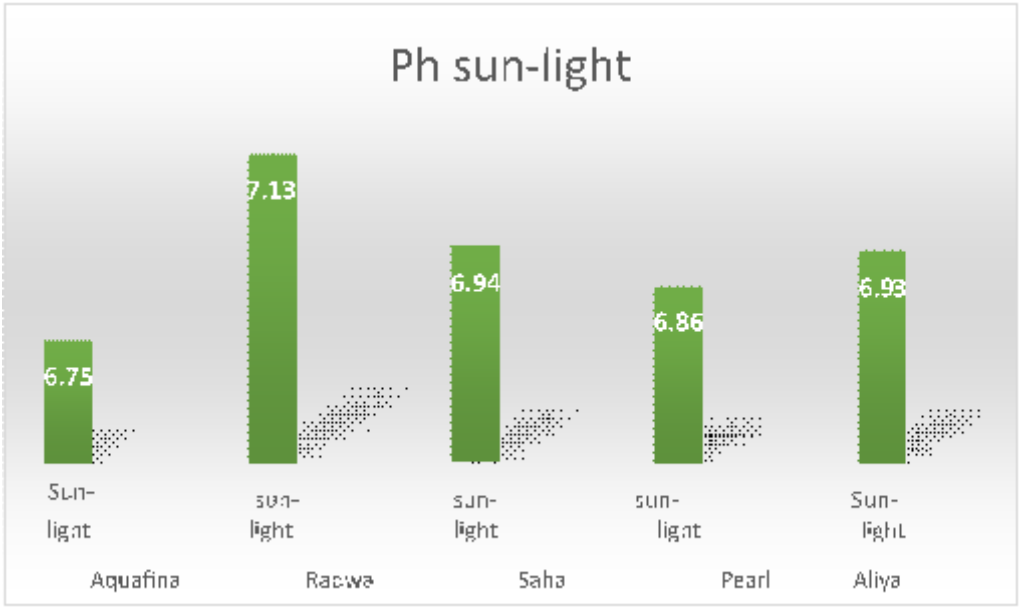


Figure 55 potential of hydrogen sun-light

Hardness

The effect of this test varies from one company to another according to the Figure below.

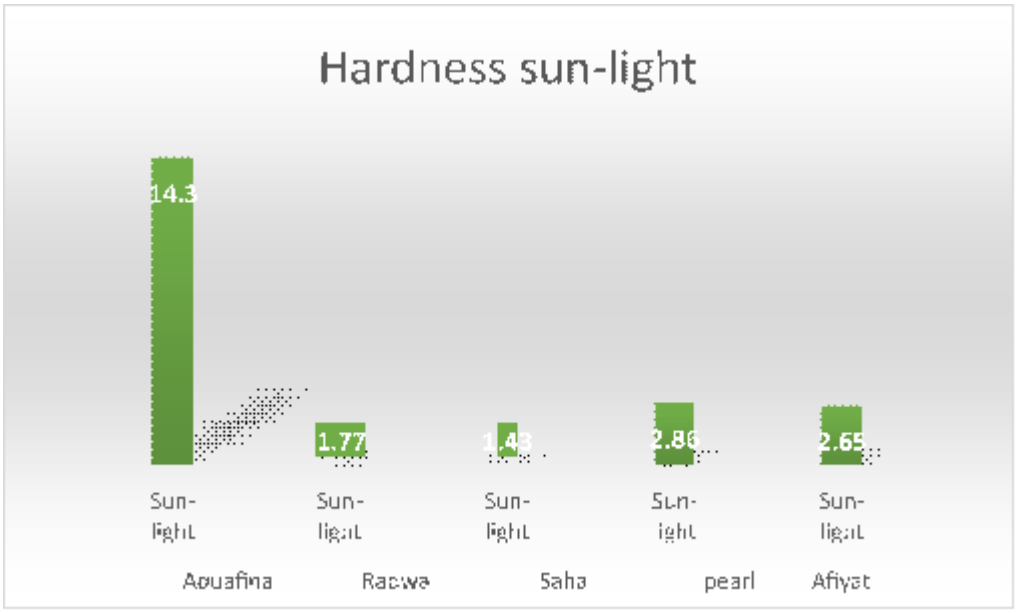


Figure 56 Hardness sun-light

Conductivity

The effect of this test varies from one company to another according to the Figure below.

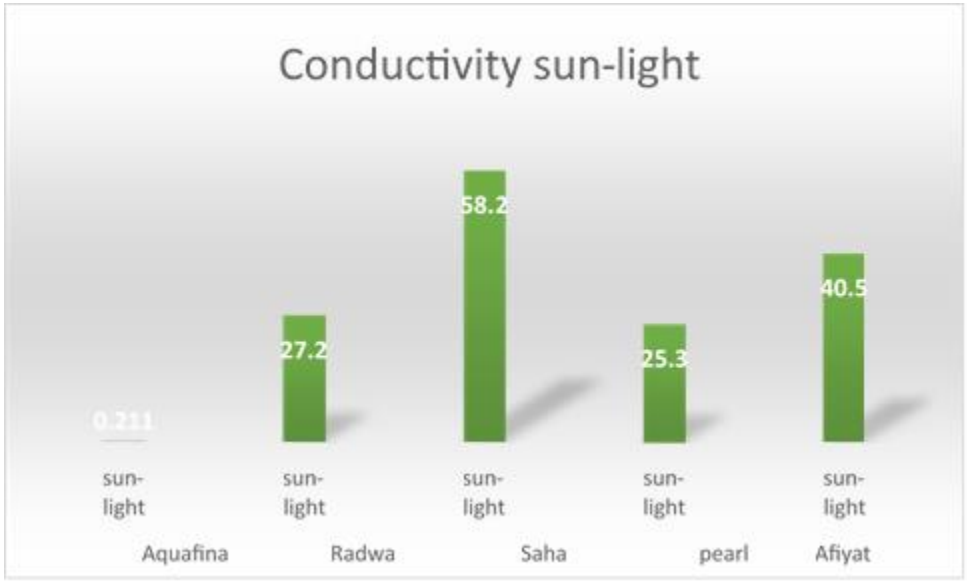


Figure 57 Conductivity sun-light

Salt

The effect of this test varies from one company to another according to the Figure below.

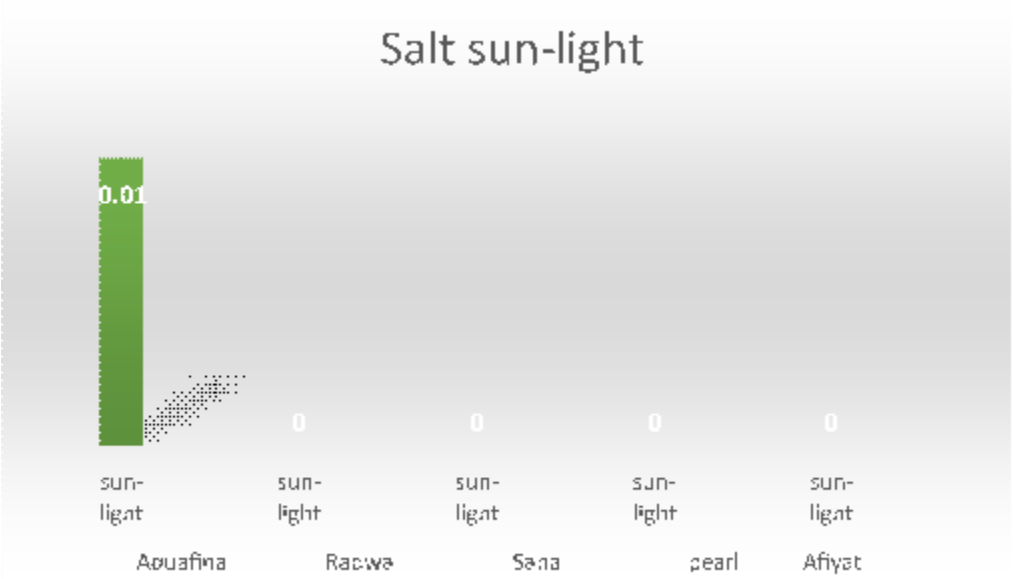


Figure 58 Salt sun-light

Chlorine

Chlorine is Zero to all the Companies.

Heat

Total dissolved solids

The effect of this test varies from one company to another according to the Figure below.

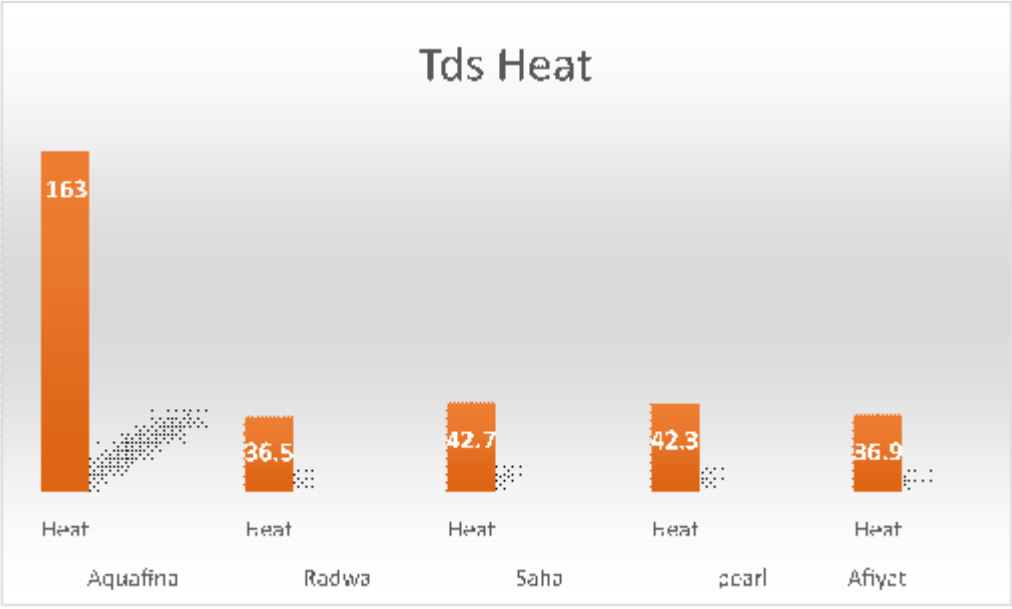


Figure 59 Total dissolved solids heat

potential of hydrogen

The effect of this test varies from one company to another according to the Figure below.

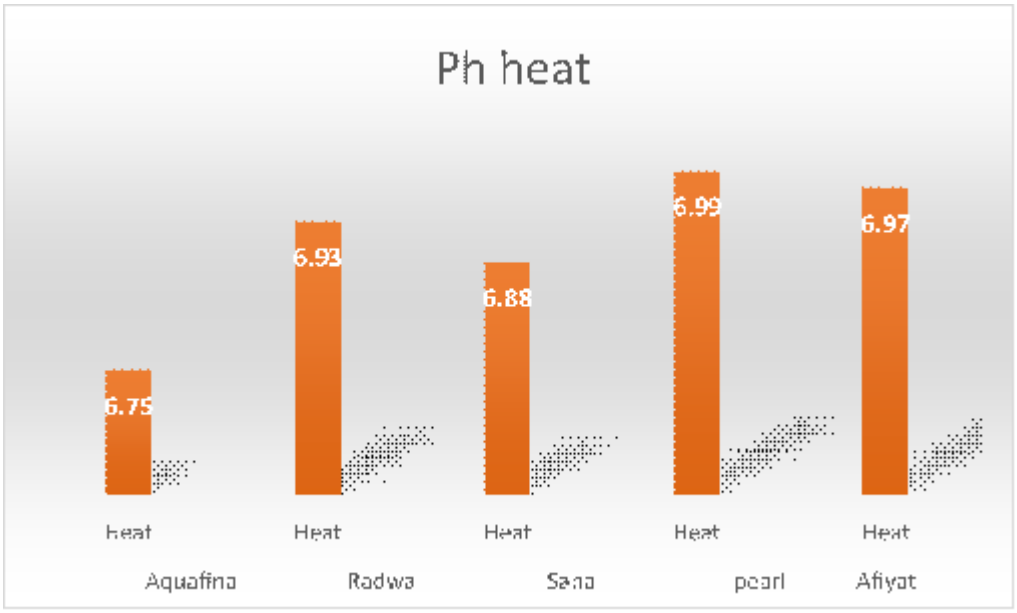


Figure 60 potential of hydrogen heat

Hardness

The effect of this test varies from one company to another according to the Figure below.

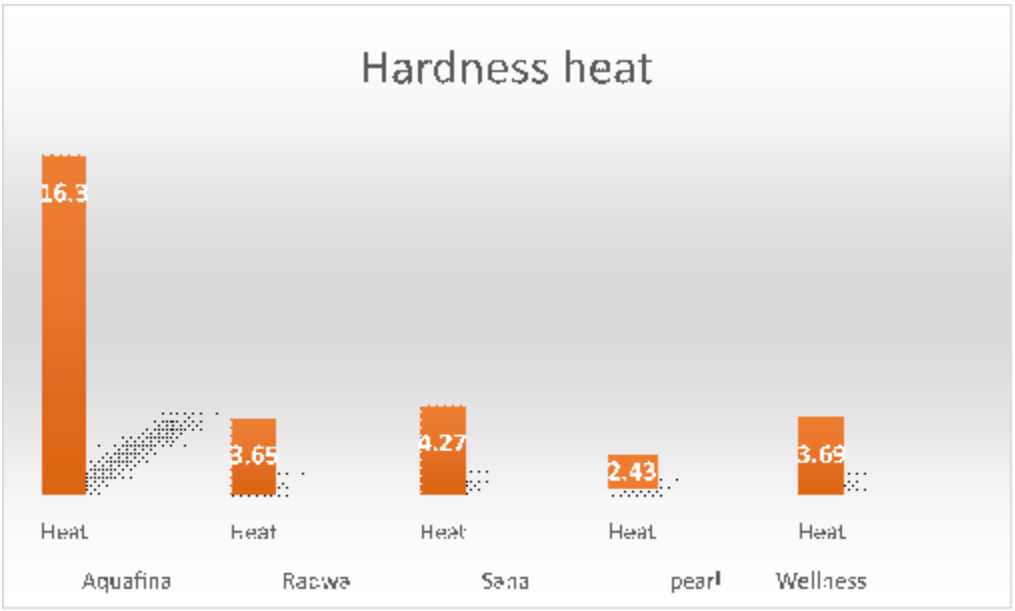


Figure 61 Hardness heat

Conductivity

The effect of this test varies from one company to another according to the Figure below.

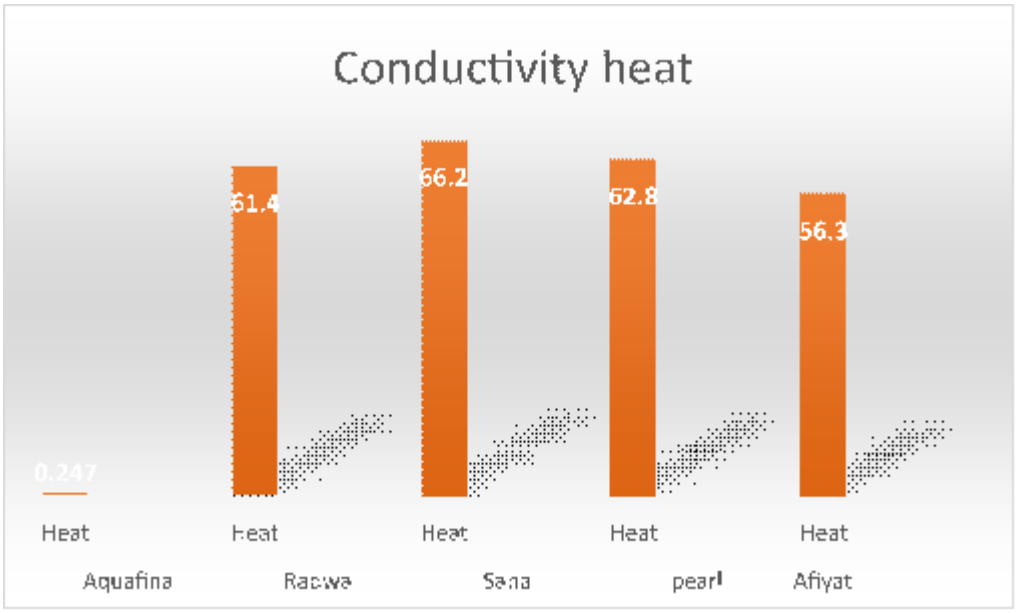


Figure 62 Conductivity heat

Salt

The effect of this test varies from one company to another according to the Figure below.

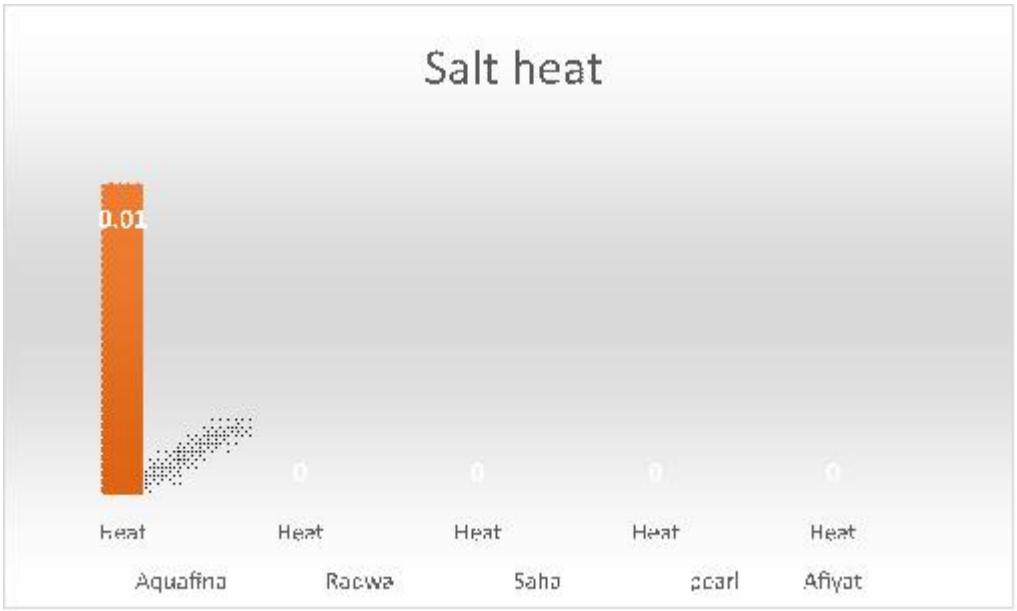


Figure 63 Salt heat

Chlorine

Chlorine is Zero to all the Companies.

Result Fabricated devices

After reviewing numerous studies, the device was manufactured. This device can measure ph, Tds.Temperture, Turbidity and hardness. It has a color screen and a Nodmcu. It is related to Excel and

Thingspeak as in 3.12 ,3.13 and 3.14. Ability to store data when the device is used in filtration plants, for example, so it can measure and store the reading before it is putting on the market.

Conclusions and Recommendations

Research summary

Because of the results obtained after analyzing samples from each of the five companies under three different conditions, we conclude that there are slight differences, but these differences affect the safety of the products. a country. for humans or not. To avoid these differences, we designed a device that is capable of calibrating water by measuring everything (PH, TDS, hardness, turbidity and temperature). This device is continuously calibrated by a very sensitive sensor to avoid error. This device can be used in the following medical cases: -

1. bottled water analysis laboratory (bottled water factory)
2. Household
3. medical center, hospital

Summarizing studies

Summarizing studies familiar to her that water sources are diverse between river water, well water and spring water. As most of the studies evaluated were experimental, with the exception of the December 28, 2022 study, which included solutions by working with a variety of sensors, including those used used in equipment we make.

Recommendations

In the future, researchers will be able to study the rest of the properties, whether chemical or physical, by measuring and analyzing different elements such as calcium, magnesium, and potassium as well. as other compounds and elements. Therefore, they are part of the composition of water. It is also possible to study the influence and different conditions under which water is packaged in plastic or glass containers. The study could be extended to bottled water sources to include entire cities.

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