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Assessments of Physical Analysis on Water Quality in Benadir Region, Somalia

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ABSTRACT

Pollution is a Presence of pollutant substances in the water which are harmful to man, plants, or property, pollutants are agents that can alter the normal characteristics of water. This needs to measure the concentration of the constituents in quantity for characterization of water for different methods and instruments or various other parameters. So that the objectives were to demonstrate a physical test (TDS, EC, PH, and Turbidity) of groundwater and to determine the water quality index in Mogadishu, Somalia. Methods: The study's design is a qualitative and quantitative descriptive study that involves diagnosing or testing 30 water samples gathered from 12 districts in Mogadishu's Benadir region from April to June 2022, Data was entered into Excel, and the data was evaluated using charts, and the water quality index (WQI). Result: In TDS concentrations ranged from 180 to 2966 mg/L (parts per million). TDS of drinking water should be less than 1000 mg/L, according to WHO recommendations, and EPA secondary drinking water regulations. TDS levels of 500 ppm are regarded safe. The pH levels were discovered to range from 5.5 to 7.0. The pH of drinking water should be between 6.5 and 8.5, according to WHO recommendations. Except for 17 samples that were out of normal range. The highest acceptable conductivity level, according to WHO [6], is 300 μS/cm. The observed conductivity of all water samples ranged from 320 μS/cm to 5774 μS/cm. in turbidity, the samples tested had turbidity levels below the maximum regulatory limit of 5 NTU. The samples were normal, with low turbidity tests below 5, except for (6.28 NTU) in Hodan. Recommendation: According to the investigation, the groundwater in the region requires some sort of treatment before it can be consumed, as well as protection from the dangers of contamination. Therefore, the study advised developing a water filtration and purification system based on regional municipals. Conclusion: Due to a lack of availability and the high cost of cooking gas, demand for charcoal is usually strong. As a result, the government should provide a steady supply of cooking gas at a low cost. This will ensure that households had access to cooking gas while also reducing the impact on forest Plants.

Keywords- Physical, TDS, Ph, EC, turbidity, Quality, Somalia

I. INTRODUCTION

Pollution is a Presence of pollutant substances in water that are harmful to man, plants, or property, pollutants are agents that can alter the normal characteristics of water. Water, as we know, goes through a cycle and picks up impurities in variable proportions along the way, such as gases from the atmosphere, inorganic and organic salts from soils and geological strata, and biological contaminants in household areas. Therefore, the quality and amount of biological, inorganic, and organic salts in water would affect its quality. For the characterization of water for various methods and equipment, as well as several other criteria, it is necessary to measure the concentration of the constituents in amount.

Due to rapid population growth, increasing urbanization, and over-exploitation of groundwater resources in Somalia, there is not made such study before and the quality of domestic water was unknown and no

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one was given serious attention. So researchers were elaborate to discover the actual quality level of the domestic water in the Benadir regions. The objectives were to demonstrate a physical test (TDS, EC, PH, and Turbidity) of groundwater and to determine the water quality index in Mogadishu, Somalia.

II. LITERATURE REVIEW

2.1. Power of Hydrogen (PH)

The pH (power of hydrogen) of water determines the dissolvent substance (chemical and suspended particles) and presence of biological micro-organisms, both can causes alteration of chemical constituents and later produce PH change, so the increase or decrease of PH is an indicator of water impurity also pH also regulates the level of acid and base water and usability of those levels.

The first parameter researchers used in this study is PH measurement, PH has a range of numbers that goes from 0 to 14 with the medial number being 7 indicating the water is neutral. PH of less than 7 indicates the acidity of water, whereas a pH of greater than or higher than 7 indicates a base of water. So this Measurement is a useful tool for testing water quality [1] [2].

When the PH of the water is high (7.5 – 14) could evoke a bitter taste in the water, Pipes and water vessels (storage tanks) become coated with deposits of minerals, and also interferes value of the chlorine disinfection when using water with high PH, it demands more chlorine when pH is high. The second level is Low-pH (0.0 - 6.0) of water which corrodes or rusts metals [3] [4].

Some factors influence the pH level of the drinking water including the source of water like bedrock, wastewater drainage, acidic rain, water use, and the level of carbon dioxide in water and atmosphere. The presence of High alkalinity in the water body means it can neutralize acidic pollution from rainfall or basic inputs from wastewater. So the source of alkalinity is from rocks and soils, some salts, also certain plant activities, and certain industrial wastewater discharges (detergents), particularly water bodies containing large amounts of compounds calcium carbonate ($CaCO_3$, limestone) be likely to be more alkaline [5].

2.2. Total dissolved solids (TDS)

The Second parameter researchers used was Total dissolved solids which abbreviated (TDS) is the word used to define all dissolved matters of inorganic minerals and some organic chemicals present in water is known as Total dissolved solids. The standard TDS constituents in tapped water (from boreholes and springs) are not <250 parts per million (ppm). The main component usually elements are sodium, calcium, magnesium, and potassium cations and carbonate, hydrogen carbonate, chloride, sulfate, and nitrate anions [6].

Total Dissolved Solids (TDS) have positively correlated with electric conductivity and alternated pH of water. The higher the TDS of water, the higher the electric conductivity and the lower the pH of the water sample. Also, TDS affects water taste and palatability. It has broader tasters concerning its TDS level, for instant range <300mg/L has excellent taste, between 300-600mg/L has good taste, between 600-900mg/L has Fair, between 900-1200mg/L has Poor taste and lastly >1200mg/L has unacceptable taste. Water that has extremely low concentrations of normal TDS may also be an unacceptable taste because it has a flat taste (4). The recommended maximum quantity of TDS for your drinking water, according to the EPA secondary drinking water regulations, is 500 ppm. TDS levels above 1000 ppm are considered unsafe. TDS is measured in milligrams per liter (mg/L), or parts per million, as a volume of water (ppm) [6] [7] [8].

Monitor or evaluating TDS level and PH in drinking water has many important reasons, first, the High TDS or low PH are indicators of the presence of harmful contaminants in the water, second measuring both TDS and PH act as an early warning system something is altering the water, third TDS and PH are easy and simple methods detecting the quality of water and this creates improvement action can be taken instantly [9].

2.3. Electrical conductivity (EC)

Electrical Conductivity is the ability to conduct electricity. Electrical conductivity refers to a medium's capacity to convey an electric current, in this instance water. The electric current is carried through water by the presence of dissolved minerals such as calcium, chloride, and magnesium. The capacity of a substance to transport an electrical current is measured by its electrical conductivity (EC). The conductivity of pure water is in the range of 0.5 to 3 µs/cm. (Siemens per meter), but the standard electrical conductivity that may be allowable is 300 μS/cm and the maximum allowable is 1000 μS/cm [10]. The resistance of the specimen may be calculated by putting a known DC voltage across a pair of parallel electrodes submerged in the sample, measuring the current generated, and computing the EC [11].

2.4. Turbidity

Turbidity is a term used to describe how clear water has become as a result of suspended matter. The World Health Organization (WHO) advises that the turbidity of drinking water be kept to a maximum of 5 nephelometric turbidity units (NTU), and preferably to a minimum of 1 NTU (NTU). High turbidity in drinkable water can hide bacteria or other organisms, which reduces the effectiveness of chlorine as a disinfectant. Organisms in highly murky water can induce symptoms like nausea, cramps, and headaches [6].

2.5. Groundwater in Somalia

High salinity, fine sand, loss of circulation, rushing sand & caving, thick mudstone, and other issues

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that will emerge during borehole drilling, such as the presence of stones, are examples of practical challenging conditions relating to groundwater in various locations of Somalia. In Somalia, groundwater is extremely important. Boreholes, shallow wells, and springs are used to obtain groundwater. The majority of boreholes are between 90 and 250 meters deep, however, certain regions have boreholes that are above 400 meters deep. The majority of shallow wells are less than 20 meters deep [12].

To ensure that the water point is hygienic, it must be positioned at least 20-30 meters away from existing pollutants, such as existing and new public water points, latrines/septic tanks/soak ways, streams, and canals, irrigation ditches, buildings, and water points. The minimum distance between permitted or unapproved solid waste dumps, burial grounds, and lubricant depots is 500 meters, and the shoreline is 100 meters.

III. METHODS AND MATERIALS

3.1. Study Design

The study's design is a qualitative and quantitative descriptive study that involves diagnosing or testing water samples gathered from 12 districts in Mogadishu's Benadir region. Mogadishu is the capital and largest city of Somalia. It has a population of 2.7 million people and seventeen districts, some of which were only recognized in the recent decade. Tap water is one of the most popular sources of drinking water, the source of this tap water is groundwater (boreholes).

The sample was examined using digital tools for water quality chemical testing. TDS Meter Digital Water Tester (Model Lxuemlu Professional 3-in-1 TDS), Portable Turbidimeter (Model Hach 2100Q), conductivity meter (model EUTECHCOND 6+), and PH meter were among the most commonly used instruments.

Figure 1: Photos of Instruments used this study, (A1 & A2), is turbidity tester, (B), is Electrical conductivity tester and (C) is TDS and EC tester.

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3.2. Sample collection

During the months of April to June 2022, 30 samples from twelve districts in the Benadir region were gathered and tested. The samples were obtained with the assistance of Hope University health science students. Around the Mogadishu region, 30 wells were found. So, using pre-washed and sterilized 500 ML plastic containers. All of the samples were registered, labeled, and physical tests of water quality were performed quickly. The instruments were portable measurements that provided immediate results, and samples were chosen using non-randomized methods, which resulted in collecting samples for various wells in each district. Some districts collected more than five samples, indicating that they have a large number of private wells that supply the various villages in this district. The following are the 12 districts in Mogadishu, Somalia, having distinct wells that provide residents with a continuous water delivery system.

Table 1. Source of water samples

NO	DISTRICTS	SAMPLES	SOURCE
1.	Boondhere	1	Shallow well
2.	Daynile	4	Tap water
3.	Dharkenley	6	Tap water
4.	Garasbaley	1	Tap water
5.	Hodon	3	Tap water
6.	Howlwadag	2	Tap water
7.	Shangani	1	Tap water
8.	Waberi	1	Tap water
9.	Wadajir	6	Tap water
10.	Warta Nabad	1	Tap water
11.	XamarJajab	1	Tap water
12.	Xamarweyne	3	Tap water
TOTAL		30	

3.3. Data Analysis

Total dissolved solids (TDS), electric conductivity (EC), turbidity test (TT), and PH testing all are physical water tests, not chemical tests. Each sample's results were written in separate papers, the data was entered into Excel, and the data was evaluated using charts, and the water quality index (WQI) [13].

The Water Quality Index, abbreviated WQI, is calculated by weighting each metric, then normalizing and standardizing the weights and parameters, and then aggregating the WQI score to produce acceptance or rejection of water quality using this scale. Total dissolved solids (TDS), turbidity test, pH test, and electrical conductivity were the four key parameters used in this investigation.

Table 2. List of physical Parameter with corresponding unit, WHO standard (Si), and normalized weight (wi).

PARAMETER	UNITS	STANDARD (SI)	WEIGHT (WI)
PH	-	8.5	0.364706
TURBIDITY	NTU	5	0.0062
TOTAL SOLIDS	mg/L	500	0.010333
ELECTRICAL CONDUCTIVITY	μS/cm	300	0.62

The Researcher analyzed the data using an Excel sheet, and the rectification errors were checked using an online system in water-research.net and standard techniques from Mishra et al. (2009), and Mr. Brian Oram, PG (2018) [14] [15]. Using the WQI formula. The readings are then standardized by dividing them by the appropriate water quality standard:

$$Qn = Vn/Sn$$

Where Qn is the parameter partial WQI score, Vn is the Observed Value concentration for parameter, and Sn is the water quality standard for parameter. The study applied the WHO 2011 [6] drinking-water criteria for water quality parameters, which are given in Table 2. The sum of the scores for each parameter multiplied by their normalized weight yields the overall WQI score:

$$WQI = \sum_{i=1}^{n} w_i q_i$$

WQI is a good tool for determining the suitability of water for many beneficial purposes, however the study made broad generalizations based on Six characteristics. According to Mishra et al., (2009), the acceptability of WQI values for human consumption is graded as follows [14].

Table 3: Water Quality Index score Mishra et al., (2009) [14].

NO	RANGE	QUALITY SCORE	GRADES
1.	0-25	Excellent	A
2.	25-50	Good	B
3.	50-70	Medium	C
4.	70-90	Bad	D
5.	90-100	Very bad	E
6.	Above 100	Unfit	F

IV. RESULTS

4.1. TDS, PH, EC and Turbidity test

The physical factors of water quality testing described in Figures 2 and 3 each have a specified range

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of standard levels with acceptable grades. TDS concentrations ranged from 180 to 2966 mg/L (parts per million). TDS of drinking water should be less than 1000 mg/L, according to WHO recommendations, and EPA secondary drinking water regulations. TDS levels of 500 ppm are regarded safe, whereas those of 1000 ppm are considered hazardous. The sample that was considered to be hazardous were daynile eleven (11) sample (1669), dharkenley (1332, 1281 and 1281), garasbaley (1378), Hodan (1260 and 1492), shangani (2232), wadajir (2319 and 2861), and Xamarweyne (1007) are among the samples had above 1000ppm. The normal range was revealed in only six (6) samples, and the remaining thirteen (13) samples have medium TDS between (500ppm – 1000pm). The TDS value is an excellent predictor of whether or not water is ideal. As a result, according to the guidelines, this water is unfit for human consumption.

The pH levels were discovered to range from 5.5 to 7.0. The pH of drinking water should be between 6.5 and 8.5, according to WHO recommendations. Except for 17 samples that were out of the normal range and the remaining 13 samples have a normal range which means samples between 6.5 – 8.5, the results were within standard criteria. In general, the pH value can be used to determine whether water is hard or soft. Pure water has a pH of 7. Water with a pH of less than 7 is considered acidic, whereas water with a pH of more than 7 is considered basic.

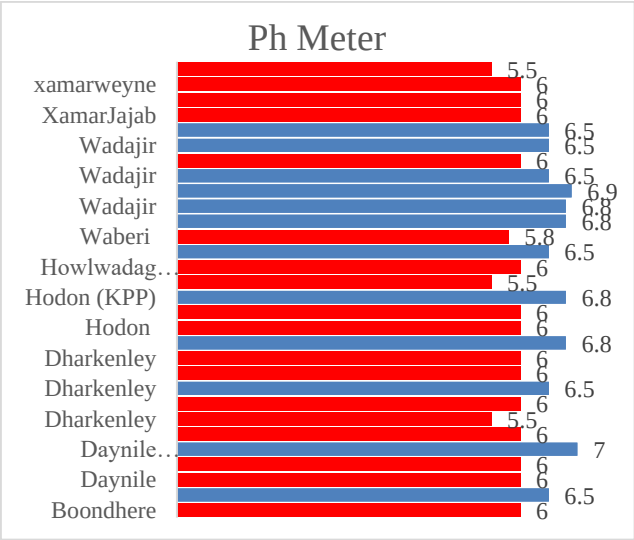

Figure 2: TDS results, Red columns have below 500mg/l.

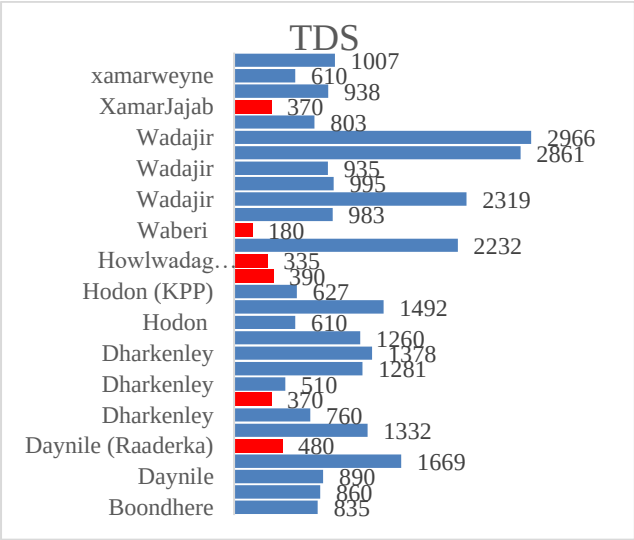

Figure 3: PH test results, Red columns have below acceptable range of PH.

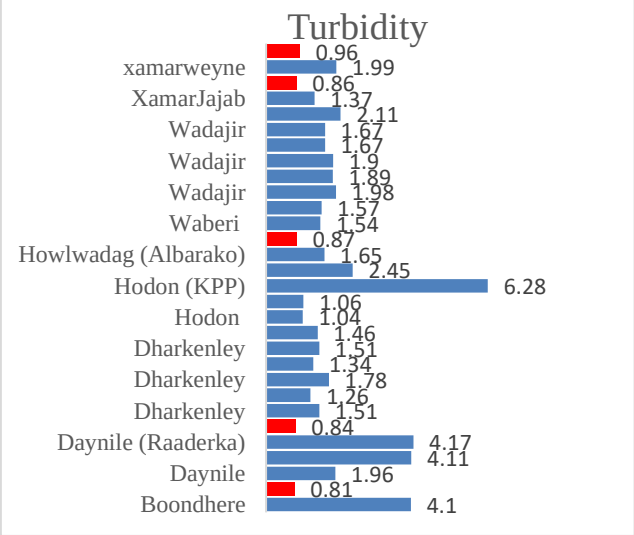

Figure 4. Electrical conductivity results, Red columns have below 1000.

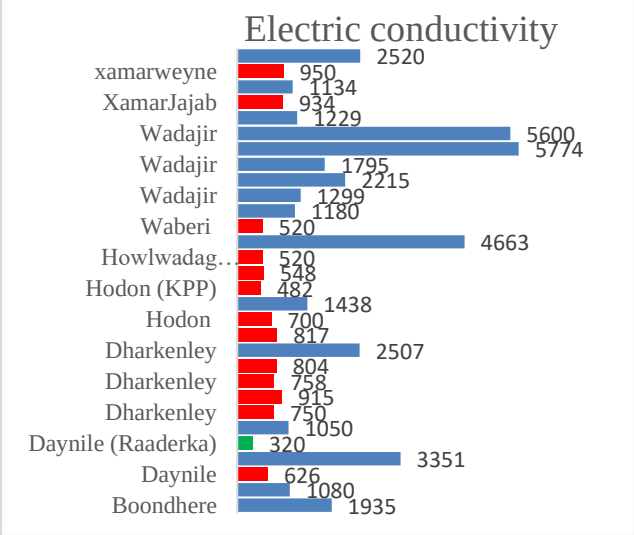

Figure 5. Turbidity test results, Red columns have below 1 range of turbidity.

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In Figure 4, the highest acceptable conductivity level, according to WHO [6], is 300 μS/cm. The observed conductivity of all water samples ranged from 320 μS/cm to 5774 μS/cm, with an average conductivity value of 102.1 μS/cm (Figure 3). The sixteen (16) samples have above 1000 μS/cm were including Boondheer (1935 μS/cm), Daynile (1080 and 3351) μS/cm, Dharkenley (1050 and 2507) μS/cm, Hodon (1438) μS/cm, Shangani (4663) μS/cm, Wadajir (1180, 1299, 2215, 1795, 5774, and 5600) μS/cm, Xamarweyne has (1134, and 2520) μS/cm, while Warta Nabad has (1229) μS/cm. As a result, according to the guidelines, this water is unfit for human consumption. While fourteen (14) samples have between 300 – 1000 μS/cm.

In figure 5, the lowest turbidity readings were found in all districts' sample water, which was predicted to be the cleanest. The results show that all of the samples tested had turbidity levels below the maximum regulatory limit of 5 NTU. The samples were normal, with low turbidity tests below 5, except for (6.28 NTU) in Hodan, which was considered an over-standard level of turbidity test.

4.1. Water quality index

The most effective methods for reporting water quality issues to the general public, and those involved in water quality management. The relative importance of several parameters in the creation of a water quality index is determined by the intended use of water. The majority of the time, it is done in order to determine its acceptability for human utilization.

Table 4: Water quality Index and its Quality scale

NO	District	Ph	TDS	EC	Turbidity	WQI	Quality scale	Grades	AWQI
1.	Boondhere	6	835	1935	4.1	84.29	Bad	D	84.29
2.	Daynile	7	480	320	4.17	83.44	Bad	D	59.82
3.	Daynile	6.5	860	1080	0.81	42.72	Good	B	
4.	daynile	6	890	626	1.96	53.31	Medium	C	
5.	Daynile	6	1669	3351	4.11	90.31	Very bad	E	53.9
6.	Dharkenley	6	1332	1050	0.84	41.43	Good	B	
7.	Dharkenley	5.5	760	750	1.51	45.85	Good	B	
8.	Dharkenley	6	370	915	1.26	44.98	Good	B	
9.	Dharkenley	6.5	510	758	1.78	53.21	Medium	C	
10.	Dharkenley	6	1281	804	1.34	46.72	Good	B	
11.	Dharkenley	6	1378	2507	1.51	54.81	Medium	C	
12.	Garasbaley	6.8	1260	817	1.46	51.66	Medium	C	51.66
13.	Hodon	6	610	700	1.04	41.81	Good	B	65.66
14.	Hodon	6	1492	1438	1.06	45.69	Good	B	
15.	Hodon	6.8	627	482	6.28	109.49	Unit for human	F	
16.	Howlwadag	5.5	390	548	2.45	56.35	Medium	C	52.38
17.	Howlwadag	6	335	520	1.65	48.41	Good	B	
18.	Shangani	6.5	2232	4663	0.87	57.51	Medium	C	57.51
19.	Waberi	5.8	180	520	1.54	45.99	Good	B	45.99
20.	Wadajir	6.8	983	1180	1.57	53.93	Medium	C	62.85
21.	Wadajir	6.8	2319	1299	1.98	61.08	Medium	C	
22.	Wadajir	6.9	995	2215	1.89	61.9	Medium	C	
23.	Wadajir	6.5	935	1795	1.9	58.79	Medium	C	
24.	Wadajir	6	2861	5774	1.67	69.89	Medium	C	
25.	Wadajir	6.5	2966	5600	1.67	71.56	Bad	D	
26.	Warta Nabad	6.5	803	1229	2.11	59.28	Bad	D	59.28
27.	XamarJajab	6	370	934	1.37	46.41	Good	B	46.41
28.	Xamarweyne	6	938	1134	0.86	41.48	Good	B	47.12

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29.	Xamarweyne	6	610	950	1.99	54.45	Bad	D	
30.	Xamarweyne	5.5	1007	2520	0.96	45.43	Good	B	

WQI had a range of scales, which equivalence, Unfit for Human consumption, very bad, Bad, Medium, Good, and excellent. Every scale has specific percentages and also they have grades based on their ordered arrangement as mentioned in table 3. So that WQI revealed that one (1) sample with (3.3%), was a Very bad water quality scale, from daynile samples, five (5) samples with (16.6%), were a Bad Quality scale, which means poor drinking water. The eleven (11) samples with (36.6%), became Medium, with a moderate water quality Index, the twelve (12) samples were Good quality with percentages (40%). Finally, one (1) sample with (3.3%), was unfit for human consumption from Hodon district samples. This shows that the city's water supply is no longer safe.

Table 5: Calculation of Average and Grades Water Quality Index

No	District	Average WQI	Quality score	Grades
1.	Boondhere[s1]	84.29	Bad	D
2.	Daynile	59.82	Medium	C
3.	Dharkenley	53.9	Medium	C
4.	Garasbaley [s1]	51.66	Medium	C
5.	Hodan	65.66	Medium	C
6.	Howlwadag	52.38	Medium	C
7.	Shangani [s1]	57.51	Medium	C
8.	Waberi [s1]	45.99	Good	B
9.	Wadajir	62.85	Medium	C
10.	Warta Nabad [s1]	59.28	Medium	C
11.	Xamarweyne	46.41	Good	B
12.	XamarJajab [s1]	47.12	Good	B

S^1 = Means one sample, not suitable for average.

Table 5, found that Eight (8) district samples were medium quality scores in average WQI, with grades C, these districts included Daynile, dharkenley, garasbaley, Hodan, Howlwadag, Shangani, Wadajir, and Warta Nabad. There are three (3) District samples were Good water quality on average of WQI, these districts include Waberi, Xamarweyne, and XamarJajab. Finally, one district has a bad water quality index, the same as its WQI in table 4.

V. DISCUSSION AND CONCLUSION

This study was concerned with the analyzing physical parameter of water from groundwater (tap) and determining of water quality index, in benadir regions, the parameter of water quality analysis was tested from thirty samples collected from different districts in Mogadishu Somalia, the Somali communities most use tap water as drinking water and domestic use water, these tap water comes from the groundwater wells like shallow wells, and borehole wells. So that they have no filtration system for all water supply systems, the government cannot develop a system for improvement of the water system in the country.

This study has revealed that TDS concentrations ranged from 180 to 2966 mg/L (parts per million), there was a variation in samples, only six (6) samples have below 500 ppm, were as 26 samples have above 500ppm, meanwhile, the eleven (11) samples have also above 1000ppm, which believed TDS above 1000ppm are considered hazardous. And according to WHO recommendations pH of drinking water should be between 6.5 and 8.5, this study received the pH levels were range "between" 5.5 to 7.0. This indicated that samples had variation in results, seventeen (17) samples had below acceptance rate of WHO, and 13 samples have between 6.5 and 8.5. The electrical conductivity of all water samples ranged from 320 μS/cm to 5774 μS/cm, with the maximum acceptable level to WHO being 300, which means all samples are out of range. The turbidity test of all the samples tested had below the maximum regulatory limit of 5 NTU except for only one sample. The samples have less or acceptable turbidity. In General table 4, one (1) sample was Very bad water quality scale, five (5) samples were Bad Quality scale, eleven (11) samples were Medium, the 12 samples were Good quality, and one (1) sample was unfit for human consumption. This proves that the city's water supply is no longer safe. table 5, as an average of WQI, summarized and categorized the thirty samples into twelve district-based samples, and found that eight (8) district samples were medium quality scores in average WQI, with grades C, and three (3) district samples were Good water quality in an average of WQI with grade B. Finally, the one district has a bad water quality index with a grade of D, as shown in table 4.

In conclusion, The WQI for 30 samples collected from 12 districts, ranges from 41.43 to 109.49. Almost ninety-one samples exceeded 100, the upper limit for drinking water. According to the investigation, the groundwater in the region requires some sort of treatment before it can be consumed, as well as protection from the dangers of contamination. Therefore, the study advised developing a water filtration and purification system based on regional municipals and educating the public about the usage of personal candle filters.

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ABBREVIATION

TDS Total dissolved solids
EC Electrical conductivity
PH Power of Hydrogen
WQI Water Quality Index
NTU Nephelometric Turbidity Units
DC Direct current
WHO World Health Organization

REFERENCE

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APPENDIX

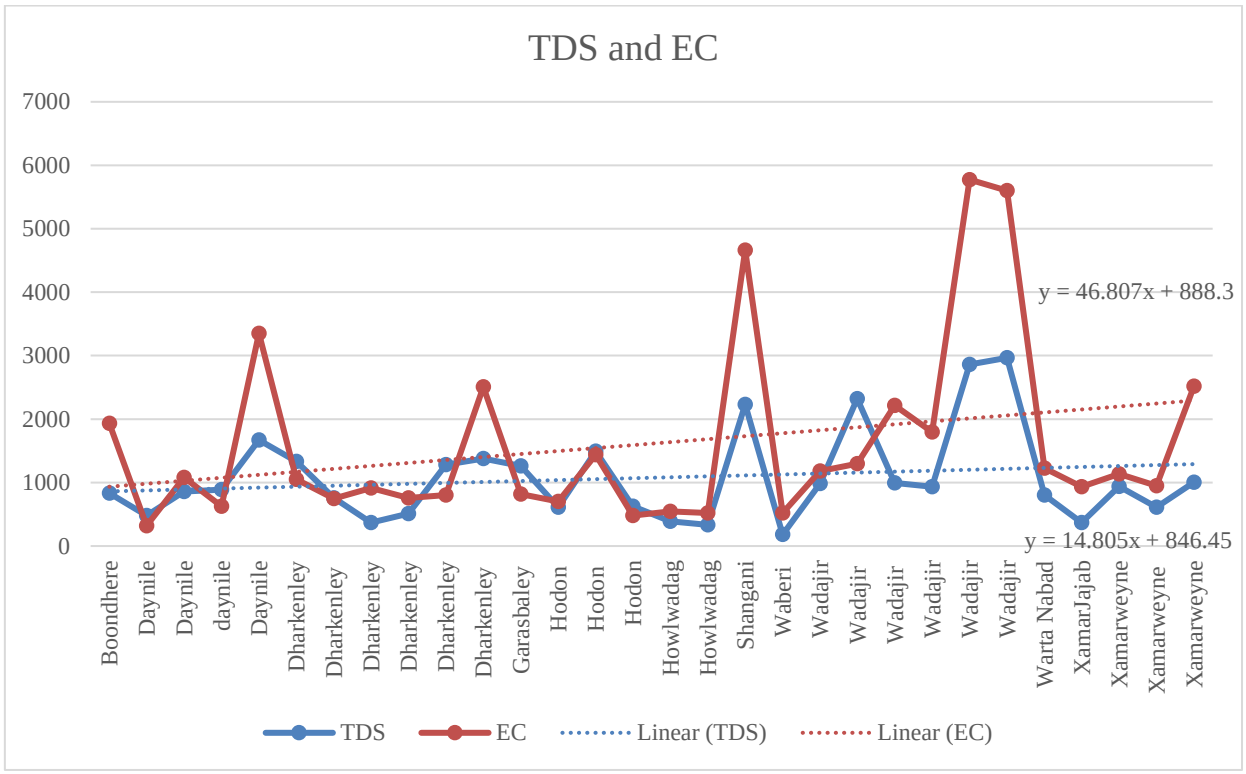

Figure 1: APPENDIX.

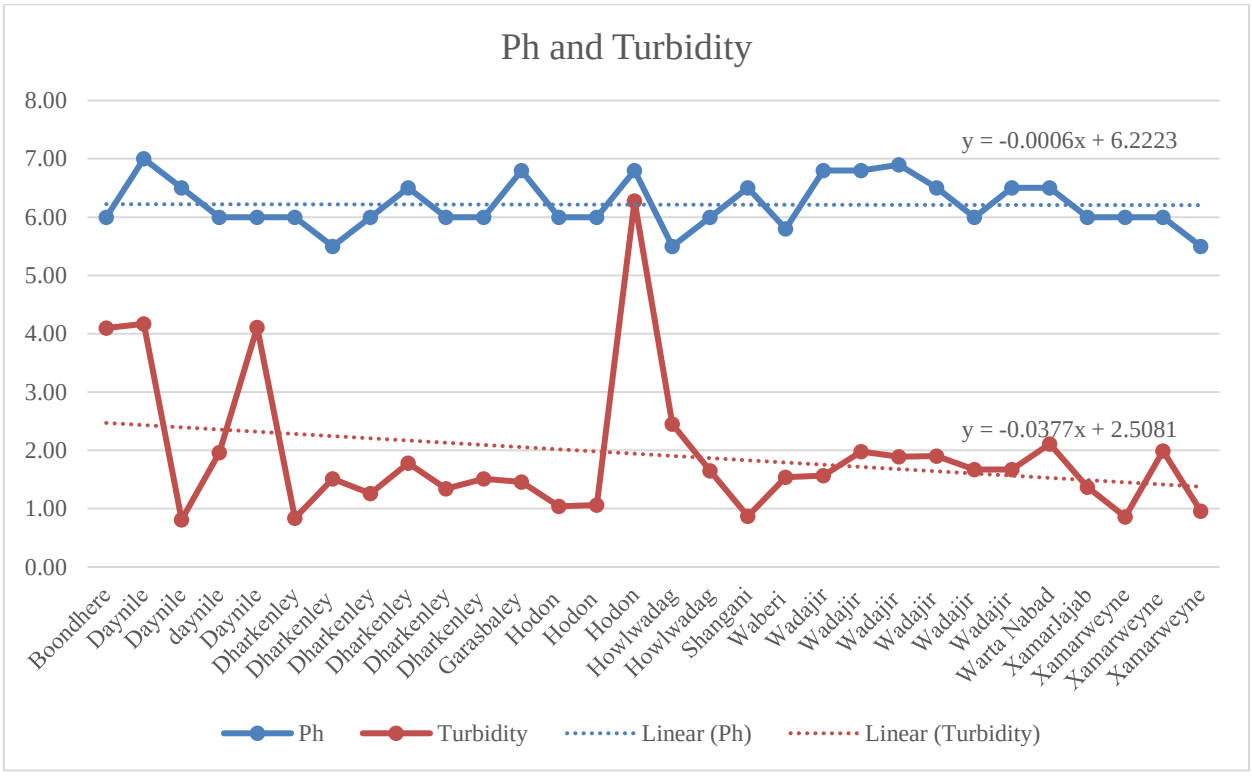

Figure 2: APPENDIX.

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Table 1: APPENDIX. TDS and PH levels of the samples

No	District	TDS	WHO guideline for TDS [7]	Ph Meter	WHO guideline for PH [7]
1.	Boondhere	835	<1000	6.0	6.5-8.5
2.	Daynile	860	<1000	6.5	6.5-8.5
		890	<1000	6.0	6.5-8.5
		1669	<1000	6.0	6.5-8.5
		480	<1000	7.0	6.5-8.5
3.	Dharkenley	1332	<1000	6.0	6.5-8.5
		760	<1000	5.5	6.5-8.5
		370	<1000	6.0	6.5-8.5
		510	<1000	6.5	6.5-8.5
		1281	<1000	6.0	6.5-8.5
4.	Garasbaley	1378	<1000	6.0	6.5-8.5
5.	Hodan	1260	<1000	6.8	6.5-8.5
		610	<1000	6.0	6.5-8.5
		1492	<1000	6.0	6.5-8.5
		627	<1000	6.8	6.5-8.5
6.	Howlwadag	390	<1000	5.5	6.5-8.5
		335	<1000	6.0	6.5-8.5
7.	Shangani	2232	<1000	6.5	6.5-8.5
8.	Waberi	180	<1000	5.8	6.5-8.5
9.	Wadajir	983	<1000	6.8	6.5-8.5
		2319	<1000	6.8	6.5-8.5
		995	<1000	6.9	6.5-8.5
		935	<1000	6.5	6.5-8.5
		2861	<1000	6.0	6.5-8.5
		2966	<1000	6.5	6.5-8.5
10.	Warta Nabad	803	<1000	6.5	6.5-8.5
11.	xamarweyne	610	<1000	6.0	6.5-8.5
		1007	<1000	6.0	6.5-8.5
		938	<1000	6.0	6.5-8.5
12.	xamarJajab	370	<1000	5.5	6.5-8.5

Table 2: APPENDIX**. Result of electrical conductivity and Turbidity test**

NO	District	Electrical conductivity (EC) per μS/cm	WHO guideline EC [7]	Turbidity test NTU	WHO guideline turbidity test [7]
1.	Boondhere	1935	< 300	4.10	<5
2.	Daynile	1080	< 300	0.81	<5
		626	< 300	1.96	<5
		3351	< 300	4.11	<5
		320	< 300	4.17	<5
3.	Dharkenley	1050	< 300	0.84	<5
		750	< 300	1.51	<5

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		915	< 300	1.26	<5
		758	< 300	1.78	<5
		804	< 300	1.34	<5
		2507	< 300	1.51	<5
4.	Garasbaley	817	< 300	1.46	<5
5.	Hodon	700	< 300	1.04	<5
		1438	< 300	1.06	<5
		482	< 300	6.28	<5
6.	Howlwadag	548	< 300	2.45	<5
		520	< 300	1.65	<5
7.	Shangani	4663	< 300	0.87	<5
8.	Waberi	520	< 300	1.54	<5
9.	Wadajir	1180	< 300	1.57	<5
		1299	< 300	1.98	<5
		2215	< 300	1.89	<5
		1795	< 300	1.90	<5
		5774	< 300	1.67	<5
		5600	< 300	1.67	<5
10.	Warta Nabad	1229	< 300	2.11	<5
11.	xamarJajab	934	< 300	1.37	<5
12.	xamarweyne	1134	< 300	0.86	<5
		950	< 300	1.99	<5
		2520	< 300	0.96	<5