



### **Abstract**

Reservoirs are vital to the world's economy for their role in electricity generation, flood control, water supply, and recreation, which are all dependent on water storage capacity. However, dams are effective traps of sediment, and capacity is reduced as deltas prograde into reservoirs.

Air, water and soil from three area at AlAhsaba were investigated. The tools that provided with Globe program were used to determine the properties of air, water and soil sample. The results of physical and chemical analysis of water samples confirmed that some sample of water are contaminated with nitrite and nitrate. In general, we can conclude the properties of the water, the air and the soil in in Nawan, Al Makhwah area.



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## **A study on Impacts of the Physical properties of the Al-Ahsaba Vally Dam**

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### **To**

**GLOBE 2020 International Virtual Science Fair**

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## 1. Introduction

Al Makhwah district is located on the coast the climate is warm in the winter and hot in the summer. Rainfall lies in the range of 229–581 mm; the average is 100–250 mm annually. Water and vegetables are essential for the human diet; in particular provide the trace elements, whereas they are vital for good health if they come from plant or an organic source.

Of all the natural resources, water is unarguably the most essential and appreciated. Life began in water and spirit is nurtured by water. It is a universal solvent and as a solvent it provides the ionic balance and nutrients, which support all forms of life. Water is one of the most abundant resources on earth, covering three fourths of the planet's surface. About 97% of the earth's water are saline water in the oceans and 3% is fresh water contained in the poles (in the form of ice), ground water, lakes and rivers, extremely valuable and with the country's rapid growth, the demand for water is increasing.

Water scarcity in Saudi Arabia is a major problem, due to the shortage of natural freshwater resources for domestic purposes. In addition, the demand for water in the Kingdom increases annually at a rate of 3% or more. In Saudi Arabia the major source of water used to meet the domestic, agricultural and industrial needs is the ground water.

As dams age they may become unsafe or no longer useful; as a result dam removal has become a viable management option in some cases. Old dams may become structurally unsound and need to be removed for public safety reasons.

In Saudi Arabia the recent source of water is dams. Dams are used to capture surface water after frequent flash floods. More than 200 dams collect an estimated 16 billion cubic feet of runoff annually in their reservoirs. This water is used for agriculture. Since no previous work has been conducted in this subject and thus no results have been published on this subject until now, this study could then serve as a guideline for further and thorough analyses of well waters in AlMakhwah, the Kingdom.



Little information is obtainable for the estimation of health effects in relation to the water in reservoirs. Soil particles containing contaminants are thereafter entrained into the environment as soil and water.

The main objective of this study is monitoring the physical properties of the air, soil and water of Al-Hasba's Valley Dam .



## **2. Materials and methods**

### **2.1. Description of the sampling sites**

Three areas were chosen for this study located within Al-Hasba's Valley Dam region, Al Makhwa, Table 1. Al Makhwah is a populated place in Saudi Arabia, Asia. It is located at an elevation of 448 meters above sea level and its coordinates are 19°46'46" N and 41°26'8" E in DMS (Degrees, Minutes Seconds) or 19.7794 and 41.4356 (in decimal degrees). It is an excellent agricultural region and has many valleys. In the western part of Saudi Arabia, the main source of water or almost the single source is groundwater. The Geographic location of the Al - Makhwah city is shown in Fig. 1. Figs .2 show the Geographic of Al-Hasba's Valley Dam.

The area of study was surveyed during 2019. Soil samples were collected by stainless steel drill. The soil was excavated up to 12-15 cm depth by an auger containing all layers. While the dust collected from special tools. The water samples were collected in polyethylene bottles (1.5 liters capacity). The sample bottles were covered immediately, after water samples from groundwater wells were taken by lowering the polyethylene bottles to about 0.5 m under the water level. The following pictures show the tests for soil .



**Table 1**

Name and coordinates of studied Dam

Dam	Name	coordinates						Heigh,m
		Latitude			longitude			
1	Al-Hasba's Valley Dam	19	41	477	41	23	211	92.1



Fig. 1 Saudi Arabia map showing Al Makhwa city



Fig. 2 Saudi Arabia map showing Al-Hasba's Valley Dam





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## Results and discussion

### 3.1 Study Area and Sample Collection

In Saudi Arabia the recent source of water is dams. Dams are used to capture surface water after frequent flash floods. More than 200 dams collect an estimated 16 billion cubic feet of runoff annually in their reservoirs. This water is used for agriculture. Since no previous work has been conducted in this subject and thus no results have been published on this subject until now, this study could then serve as a guideline for further and thorough analyses of well waters in Almahwah, the Kingdom.

### 3.2 Analysis of atmospheric and climate

Table 2 shows the date of investigation of atmospheric and climate. As shown the current temperature is 33.2°C, maximum temperature 34.6 °C and minimum is 25.7 °C. The humidity for all spots has a value 31 % .

### 3.3 Analysis of water samples.





The physical and chemical properties of collected water samples from studies area are filled in Table 3. It is clearly shown that the water has 54 cm<sup>2</sup> . Water have 5 mg/L dissolved oxygen .












All the samples is near to neutral. All samples have salinity increased to 500 mg/L that make the water in suitable for domestic uses. The chemical analysis were shown that water have high content from nitrite and nitrate which increase about the local standard limits for water.








### 3.4 Analysis of soil samples.






Soil analysis results showed that the samples have a various structure. In addition, most samples have a color degree close to each other. All soils have a sandy texture structure except one sample.

The lowest amount of carbonate was in the third sample.

Title	Pictures
1-Determination of air temperature	
2-Determination of soil temperature	
3-Humidity apparatus	
4-Clouds	

Title	Pictures
1- Determination of dissolved oxygen	   <p>1                      2                      3</p>   <p>4</p>
2- Test of nitrate in water	   <p>1                      2                      3</p>    <p>4                                      5</p>

Title	Pictures
3- Transparency tube	<div data-bbox="663 468 847 703">  <p>1</p> </div> <div data-bbox="1034 456 1209 692">  <p>2</p> </div>
4- Conductivity	<div data-bbox="738 748 930 1001">  </div>
5- PH	<div data-bbox="738 1046 930 1299">  </div>
6- Salinity	<div data-bbox="686 1348 861 1599">  <p>1</p> </div> <div data-bbox="904 1348 1080 1599">  <p>2</p> </div> <div data-bbox="1133 1348 1300 1599">  <p>3</p> </div>

Title	Pictures
1- Soil structure	
2- Soil consistency	
3- Soil texture	
4- Amount of roots	
5- Quantity of rocks	













Title	Pictures
6- Amount of carbonates	  <div style="display: flex; justify-content: space-around; width: 100%;"> <span>1</span> <span>2</span> </div>
7- The primary soil color	
8-Secondary soil color	
9- pH for Soil	<div style="display: grid; grid-template-columns: repeat(3, 1fr); gap: 10px;">       </div> <div style="display: grid; grid-template-columns: repeat(3, 1fr); gap: 10px; margin-top: 10px;"> <span>1</span> <span>2</span> <span>3</span> <span>4</span> <span>5</span> <span>6</span> </div>



Table 2

## Analysis of atmospheric and climate

Da m	Date	Time	Air Temperature °C			Soil temperature °C			Heat and humidity		Relative atmospheric pressure ,mabr	Clouds		
			Current	Maximu m	Minimum	Current	Maximu m	Minimum	Ambient air temperature, °C	Humidity,%		Cloud cover	Type	Proportion ,%
1	18/2/2020	10:15 am	33.2	34.6	25.7	30.4	31.4	26.6	35.5	31	1014	sky	Clear	0



**Table 3**

Analysis of water

Dam	Physical properties						
	Transparency Cm <sup>2</sup>	Temperature °C	Dissolved oxygen mg/L	PH	Conductivity mS/cm	Salinity	Nitrates mg/L
1	54	26.6	5	4.1	635	4.2	6





**Table 4**

## Physical Properties of Soil

Dam	Soil structure	Soil color		Soil consistency	Soil texture	Amount of roots	Quantity of rocks	Amount of carbonateS	PH	Soil temperature ,C		
		The primary soil color	Secondary soil color							Current	Maximum	Minimum
1a	Single graned	10YR5I4	10YR5I4	Loose	Sand	None	Many	None	8.6	30.4	31.4	26.6
1b	granular	2.5Y4I4	2.5Y5I4	Fri able	Sand	Few	Few	Strong	6.1			
1c	Massive	10YR4I4	10YR5I4	Firm	Clay	Few	None	Strong	9.3			



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الشفافية المياه

SECCHI القرص اختبار 1

المسافة من المراقب حتى ...

القرص (سيكي) تصل إلى أسفل و لا تختفي

إلى سطح الماء m

حيث يختفي قرص m

حيثما يظهر القرص ثانياً m

إضافة

أنتوب اختبار الشفافية 1

cm 52

أكثر من عمق أنتوب الشفافية ؟

إضافة

تعليقات

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درجة الحرارة المياه

قياس مع: ميزان الحرارة المملوء بالكحول \*

ميزان الحرارة المملوء بالكحول

مسيار

1

درجة الحرارة 26.6 °C

إضافة

تعليقات

الأكسجين المذاب

الطريقة المستخدمة: عدة

عدة

مسيار

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الأكسجين المذاب

الطريقة المستخدمة: عدة

عدة

مسيار

Dissolved Oxygen kit

LaMotte manufacturer

model

1

الأكسجين المذاب 5 mg/L

التملح

ppt 4.2

إضافة

تعليقات

الموصلية الكهربائية

الموصلية الكهربائية

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الموصلية الكهربائية

درجة حرارة عينة المياه التي يجري اختبارها

مئوية 26.6

الموصلية القياسية

نانومترية / سم 635

1

الموصلية 635 نانومترية / سم

إضافة

تعليقات

التملح

معلومات المد

وقت المد و الجزر قبل قياس التملح ( UTC 24HR)

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التملح

معلومات المد

وقت المد و الجزر قبل قياس التملح ( UTC 24HR)

وقت

ارتفاع المد والجزر

جزر

وقت المد و الجزر بعد قياس التملح ( UTC 24HR)

وقت

ارتفاع المد والجزر

جزر

موقع المد

موقع خط العرض 19.41477

موقع خط الطول 41.23211

موقع Elevation 92.1 M

خط عرض مكان القياس

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عينات مقياس نقل السائل النوعي

1

درجة حرارة عينة الماء في أنبوبية ٥٠٠ مل

مئوية 26.6

جاذبية خاصة 1

جزء في التريليون 4.2

إزالة

إضافة

عينات المعايرة

1

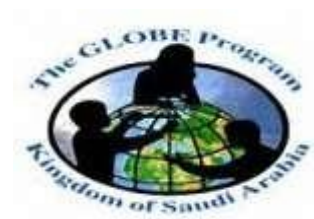
ملوحة عينة

جزء في التريليون

إزالة

إضافة

تعليقات



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pH حذف توسيع / طبي

Measured with: مقياس درجة الحموضة \*

ورقة الحموضة

مقياس درجة الحموضة

1

إذا أضيف الملح ، التوصيل الكهربائي

نانونائية / سم 635

درجة الحموضة 4.1

إضافة

القيمة التخزين المستخدمة

درجة الحموضة 4 ☒ درجة الحموضة 7 ☐ درجة الحموضة 10 ☐

تعليقات

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نترات حذف توسيع / طبي

kit نترات

LaMotte manufacturer

model

1

النترات والنترات

ملح / نترات والنترات النترات النترات

6

النترات (اختياري)

ملح / نترات النترات

6

إضافة

تعليقات

data.globe.gov

نترات حذف توسيع / طبي

kit نترات

LaMotte manufacturer

model

1

النترات والنترات

ملح / نترات والنترات النترات النترات

6

النترات (اختياري)

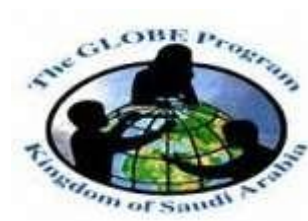
ملح / نترات النترات

6

إضافة

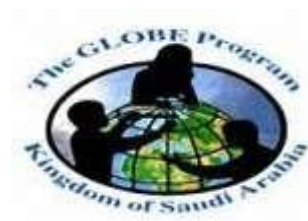
تعليقات

إلغاء إرسال البيانات إعادة تعيين



## GLOBE BADGES

Ghdeer Ali Ahmed ALZahrani	Maryam Owad Ahmed Al-Zahrani
Enter the measurements into the Globe site	Water measurements of the Wadi Al-Hasba dam
Soil measurements for the Wadi Al-Hasba dam	Soil measurements for the Wadi Al-Hasba dam



### **3. Conclusion**

We can summarize some of the results as the following:-

1. The results of the analysis of well water showed that it contains large percentages of salinity, nitrate and nitrite, which makes it unsuitable for different uses.

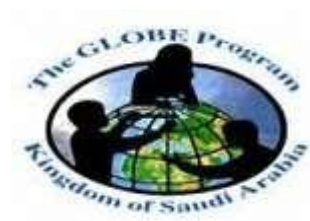
### **Acknowledgement**

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### Work Plan

The project's head, Aisha Khader Mohammed Al Zaili, distributed the work to the team as follows:

- ✚ Students collect samples from various sites over a period of days.
- ✚ Field studies were carried out for five different farms in the Nwan area and measurements of different weather conditions at each site.
- ✚ Test and analysis the samples (water, soil and air) on Globe program devices.
- ✚ Make reports about each site
- ✚ Assigning the Globe program coordinator, Ida Ali Hussein Al-Rashedi, to follow up the students during the experiments on the environmental globules and to establish sites for field studies on the school's Globe website.
- ✚ The project leader communicates with the academic supervisor to conduct some specialized analysis, quality and consultation.