Kingdom of Saudi Arabia
Ministry of Education / AlQunfotha
The 1st AlMuthilif Secondary Girls School

Ecosystem Engineering at Mangrove site in AlMuthailif coastline

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For Globe 2022 International Virtual Science Symposium

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Abstract

We are engineers by planning, planting and participating in building new ecosystem
For this reason we start our project which talk about
How can we face global issues now and in the future?
How can we Offset 96 million tons of CO_2, stabilize
coastline ecosystems and prevent erosion
How can we prevent our city from desertification ?
So in this research we will focus on our city ALMuthailif coast line
And planting mangrove trees on seaboard as a solutions for most of issues .

introduction

Since we heard about global issues at school and media
We got attractive to any solutions that we read or hear
One day we heard about **The Saudi Green Initiative**
its aim to Offset 96 million tons of CO_2, stabilize coastline ecosystems and prevent erosion
By planting mangrove trees.
This chance is the one that me and my globe team in the school are waiting for.
So we signed as volunteers to participate in this event
But as globe students we did it in our way
We collect samples of soil and sea water ,study location and climate there
and make our own study and research
These goals is a part for our future to coastal management
and to building the resilience of ecosystem-dependent coastal communities.
In this research we will spot in mangrove and how it effect in
ecosystem. Also,the location study of Almuthilif city

Participation certificates


شهادة شكر وتقدير

يسر مكتب وزارة البيئة والمياه والزراعة بمحافظة القنفذة أن يتقدم بالشكر والتقدير
للطالبة / ليان محمد الراشدي من الثانوية الأولى بالمظيلف
وذلك نظير الجهود المثمرة والمشاركة المتميزة في المبادرة التطوعية لزراعة أشجار
المانجروف على ساحل البحر الاحمر-مركز المظيلف ضمن مبادرة "لنجعلها خضراء"
التي أقيمت خلال الفترة من ١٤٤٣-٠٣-٢٧هـ إلى ١٤٤٣-٠٤-٠١هـ
سائلين الله لها دوام التوفيق والنجاح.

مدير مكتب
وزارة البيئة والمياه والزراعة بمحافظة القنفذة
حسن بن إبراهيم المعيدي

لنجعلها خضراء


وزارة البيئة والمياه والزراعة
Ministry of Environment Water & Agriculture
Kingdom of Saudi Arabia المملكة العربية السعودية
مكتب وزارة البيئة والمياه والزراعة
بمحافظة القنفذة


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لنجعلها خضراء

Questions and the Description of the problem

ALMuthailif city in short line :
it is a seaboard small city in the southwestern region in Saudi Arabia (see location figure 3-2)
Although it has so many valleys , it is enclosed by deserts.
The weather as shown in figure (3-3) is warm in winter
And hot in summer
So thinking about possibility to make it a green city would be difficult .
This area suffers from desertification
For that planting mangrove forest across the coast are extremely productive ecosystems, providing critical services that make benefits.
Q1:is this solution could be possible or not ?

Figure (3-2)

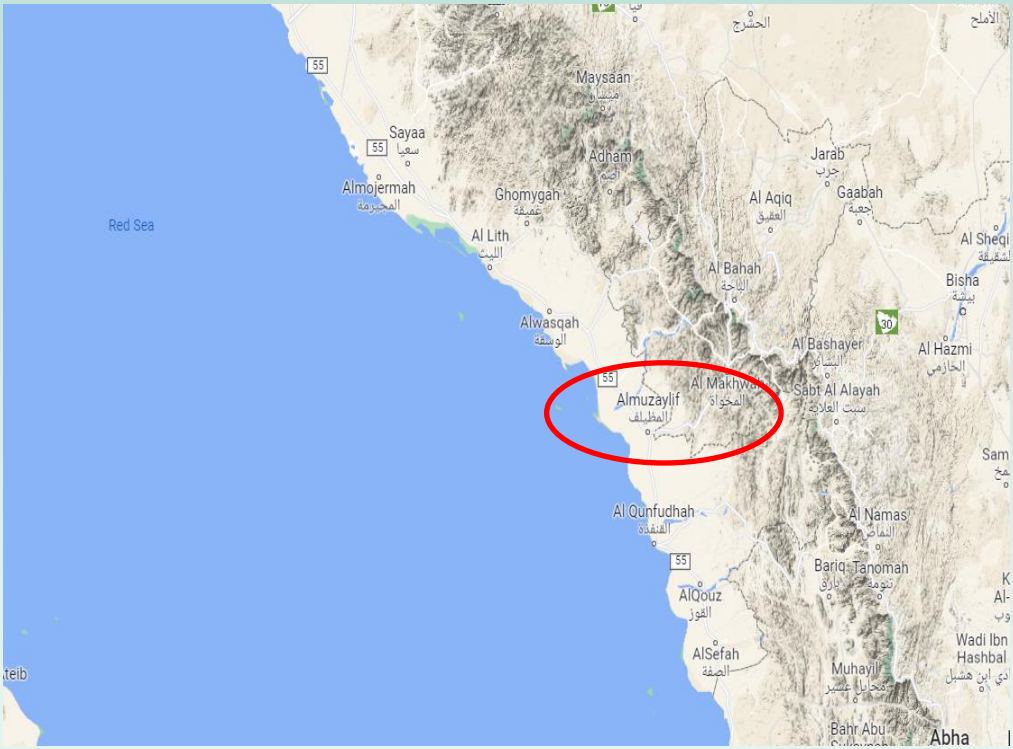


Figure (3-3)

Climate data for Al-Qunfudhah [hide]													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average high °C (°F)	31.3 (88.3)	32.2 (90.0)	34.7 (94.5)	37.8 (100.0)	40.7 (105.3)	42.6 (108.7)	41.8 (107.2)	41.0 (105.8)	40.9 (105.6)	38.4 (101.1)	35.3 (95.5)	32.8 (91.0)	37.5 (99.4)
Daily mean °C (°F)	26.1 (79.0)	26.8 (80.2)	28.9 (84.0)	31.4 (88.5)	33.9 (93.0)	35.8 (96.4)	35.9 (96.6)	35.4 (95.7)	34.4 (93.9)	31.8 (89.2)	29.4 (84.9)	27.2 (81.0)	31.4 (88.5)
Average low °C (°F)	21.0 (69.8)	21.4 (70.5)	23.2 (73.8)	25.0 (77.0)	27.2 (81.0)	29.0 (84.2)	30.1 (86.2)	29.9 (85.8)	27.9 (82.2)	25.2 (77.4)	23.6 (74.5)	21.6 (70.9)	25.4 (77.8)
Average precipitation mm (inches)	29 (1.1)	9 (0.4)	12 (0.5)	20 (0.8)	18 (0.7)	8 (0.3)	7 (0.3)	16 (0.6)	15 (0.6)	15 (0.6)	18 (0.7)	24 (0.9)	191 (7.5)
Source: Climate-Data.org[9]													

Q2:why mangrove?

Mangrove trees Perennial evergreen grows in the marshes with salt and fresh water, As well as growing near the shores of the sea in areas of tidal flood water so that water drown the root group Permanently.

Mangrove grows mainly in tropical and subtropical protected severe ocean currents, but it can grow in areas prone to storms.

There are many classification of mangrove combine common features. These trees bear the extreme salinity of the soil as it bears to live in oxygen-poor soils. So it is able to grow in moist soil or water immersed completely.

Mangrove trees grow in the tropics and subtropics, Specifically in the coastal environments saline or brackish, And relatively low exposure to strong waves, Such as small gulfs ending to the coasts as a help to break the power of the destructive waves of small plants, Lakes and estuaries, or shallow areas in the islands near the coast. It is grown at the border between sea and land.

Mangrove need water swamps rich in organic matter to grow healthy.

It can also live in the sand with few coarse pores, and does not harm it if this sand covered with mud.

As they grow without problems in some areas where the salinity concentration of at least.

Mangrove forests are extremely productive ecosystems, providing critical services that benefit all of us

1.Biodiversity. Home to an incredible array of species, mangroves are biodiversity hotspots. They provide nesting and breeding habitat for fish and shellfish, migratory birds, and sea turtles. An estimated 80% of the global fish catch relies on mangrove forests either directly or indirectly

2.Livelihoods. The rural communities we work with are fishers and farmers who depend on their natural environment to provide for their families. Healthy mangrove ecosystems mean healthy fisheries from which to fish, and healthy land on which to farm.

3. Water. Mangroves are essential to maintaining water quality. With their dense network of roots and surrounding vegetation, they filter and trap sediments, heavy metals, and other pollutants. This ability to retain sediments flowing from upstream prevents contamination of downstream waterways and protects sensitive habitat like coral reefs and seagrass beds below.

4. Coastal defense. Mangroves are the first line of defense for coastal communities. They stabilize shorelines by slowing erosion and provide natural barriers protecting coastal communities from increased storm surge, flooding, and hurricanes

5. Carbon storage. Mangroves "sequester carbon at a rate two to four times greater than mature tropical forests and store three to five times more carbon per equivalent area than tropical forests" like the Amazon rainforest. This means that conserving and restoring mangroves is essential to fighting climate change, the warming of the global climate fueled by increased carbon emissions, that is already having disastrous effects on communities worldwide. At the same time, mangroves are vulnerable to climate change as sea level rise pushes ecosystems inland.

6. Materials. In addition to consuming fish and shellfish from the mangroves, communities have historically used mangrove wood and other extracts for both building and medicinal purposes. Their potential as a source for novel biological materials, such as antibacterial compounds and pest-resistance genes, remains largely undiscovered. Mangroves represent less than 0.4% of the the world's forest, but they're disappearing three to five times faster than forests as a whole.

7. Sustainable development. Intact and healthy mangrove forests in El Salvador have an untapped potential for sustainable revenue-generating initiatives including ecotourism, sport fishing, and other recreational activities.

Source code

4/Methods And Materials

I-Location

Site	coordinate		high	source
	Latitude	longitude		
AlMuthilif coastline	19.519622 N	40.954781 E	140	Gps

2-tempreture of air ,water and soil.
9/11/2021

protocols	current	Max	Min
air	29.4	31.9	28.1
water	28	-	-
Soil 10cm	27.3	29	26
humidity	48	51	40

3-cloud observation.

level	kind	visibility	type
Observability total cover isolated 15%			
High level	isolated	12%	cirrus
Mid level	none	-	-
Low level	visible	10%	cumulus

Pressure 1016 mbar

4-Physical property of sea water

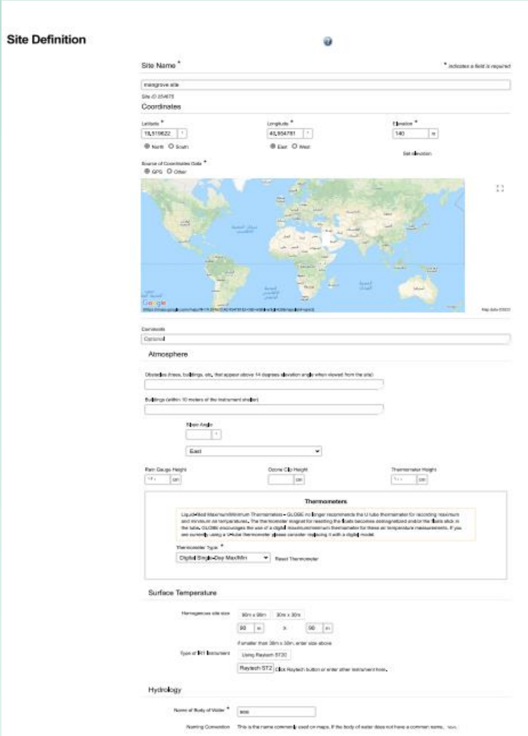
Physical Property		Measure
1	Transparency	60 cm^2
2	Temperature in site	28
3	Temperature in room	25
4	Dissolved oxygen	8 mg/ml
5	PH	6
6	Conductivity	900 Ms/cm
7	Salinity	5.9
8	Nitrates and nitrite	0

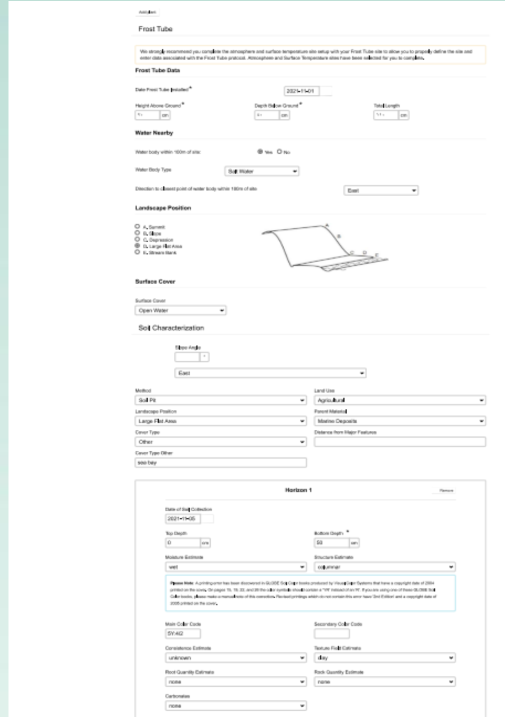
5-Property of soil

property		result
1	Soil structure	granular
2	Soil texture	clay
3	Oil color	5Y4l2
4	Soil consistency	friable
5	Amount of roots	none
6	Amount of rocks	none
7	Amount of carbonate	none
8	PH	6.7
9	Soil Humidity	wet

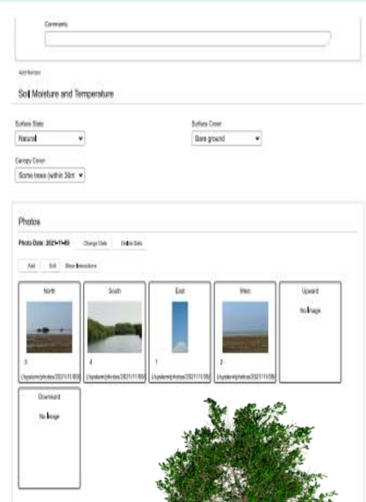
6-Tree Observations

observation	9/11/2021	11/12/2021	3/3/2022
Phenological Gardens health	Healthy	healthy	healthy
Phenological Gardens high	50	56	70
Ground Observations	Green no brown	Green no brown	Green no brown
Type of tree	DS Mangrove		
Leave color	5GY:4/8	5GY:4/8	5GY:4/8

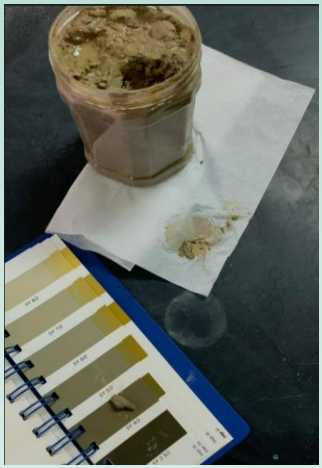

Site Definition
Site Name *
* indicates a field is required
mangrove site
Coordinates
Latitude *
18.519622
Longitude *
40.954781
Elevation *
140
Set elevation
Source of Coordinates Data *
GPS
Other
Comments
Optional
Atmosphere
Slope Angle
East
Rain Gauge Height
Ozone Clip Height
Thermometer Height
Thermometers
Thermometer Type *
Digital Single-Day Max/Min
Reset Thermometer
Surface Temperature
Homogeneous site size
90m x 90m
30m x 30m
Type of IRT Instrument
Using Raytech ST20
Hydrology
Name of Body of Water *
Naming Convention

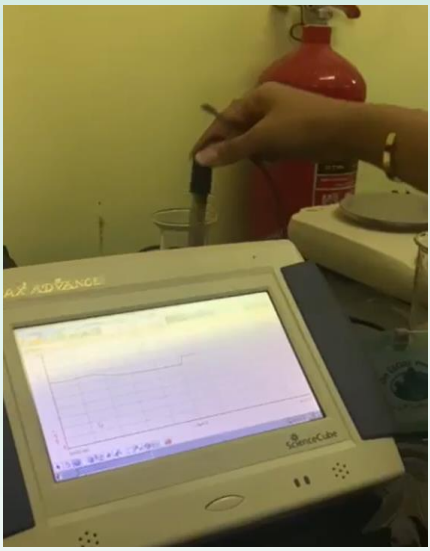

Frost Tube
Frost Tube Data
Date Frost Tube Installed *
2021-11-01
Height Above Ground *
Depth Below Ground *
Total Length
Water Nearby
Water body within 100m of site:
Water Body Type
Salt Water
Direction to closest point of water body within 100m of site
East
Landscape Position
A. Summit
B. Slope
C. Depression
D. Large Flat Area
E. Stream Bank
Surface Cover
Open Water
Soil Characterization
Slope Angle
East
Method
Soil Pit
Land Use
Agricultural
Landscape Position
Large Flat Area
Parent Material
Marine Deposits
Cover Type
Other
Distance from Major Features
Cover Type Other
sea bay
Horizon 1
Date of Soil Collection
2021-11-05
Top Depth
0
Bottom Depth *
50
Moisture Estimate
wet
Structure Estimate
columnar
Main Color Code
5Y 4/2
Secondary Color Code
Consistence Estimate
unknown
Texture Field Estimate
clay
Root Quantity Estimate
none
Rock Quantity Estimate
none
Carbonates
none


Water Body Type *
Salt Water
Water Body Source
Other
Width of Moving Water
Area of Standing Water
Average Depth of Standing Water
Water Sample Location
Boat
Can you see the bottom?
Yes
No
Carbon Cycle
Site Description (check all that apply) *
Site Shape *
Standard (square, rectangle, circle)
Non-Standard
Site Shape can't be changed, due to existing Carbon Cycle observations for this site.
Total Area of the Site (m^2) *
8800
Land Cover
MUC Description
Open Water
Open Water, Marine
MUC Code *
72
Phenological Gardens
Soil Characteristics
Soil Texture:
Sandy Clay
pH Method:
pH Meter
pH of Soil
8.45
Plants
Plant Type: *
Witch Hazel (Genuine)
Date Planted: *
2021-11-01
Plant Number: 1
Lilacs
Lilac Shrubs
Shrub ID: 1
Shrub Name: *
mangrove
Date Planted:
2021-11-01
Clonal/Common: *
Common
Date Died:
Height at planting:
50


Comments
Soil Moisture and Temperature
Surface State
Natural
Surface Cover
Bare ground
Canopy Cover
Photos
Photo Date: 2021-11-09
Change Date
Delete Date
Add
Edit
North
South
East
West
Upward
No Image
Downward
No Image

Measurement in location





Samples Measurement at school's lab

Ready to plant 9/11/2021

done9/11/2021

After one month 11/12/2022

4 months 3/3/2022

6-conclusion

As a result of this researches mangrove will survived and we will get ecosystem for those reasons :

- **water salinity**
- **Low risk of flooding by tide**
- **Slightly sloping terrain**

.Clarity of the water
.Protecting area until grow

<u>What we did for this project:</u>
Participate in this initiate
Keep Doing research and observations
Educate the culture about the important of mangrove .

We are engineers by planning, planting
and participating in building new ecosystem

7-Badges:

*Be collaborator
This research by Globe team at school
Laian Mohammed
Wajed Ibrahim
Al Anood Hashem

*Be an Engineer
Transferring desert to Green lands by planting the coastline of this city

*Be an impact
Concerning about global issues and working on solutions

8-Bibliography/citations

*Degradation of mangrove tissues by arboreal termites (Nasutitermes acajutlae) and their role in the mangrove C cycle (Puerto Rico) : Chemical characterization and organic matter provenance using bulk d13C, C/N, alkaline CuO oxidationGC/MS, and solid-state 13C N

Jayatissa, L. P.; Dahdouh-Guebas, F.; Koedam, N. (2002). "A review of the floral composition and distribution of mangroves in Sri Lanka“

The United Nations General Assembly has declared the years 2021 through 2030 the UN Decade on Ecosystem Restoration **Six things you can do to bring back mangroves**

Fisheries Western Australia. 2013. Archived from the original

9-Acknowledgment

This environmental research is presented by students:

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