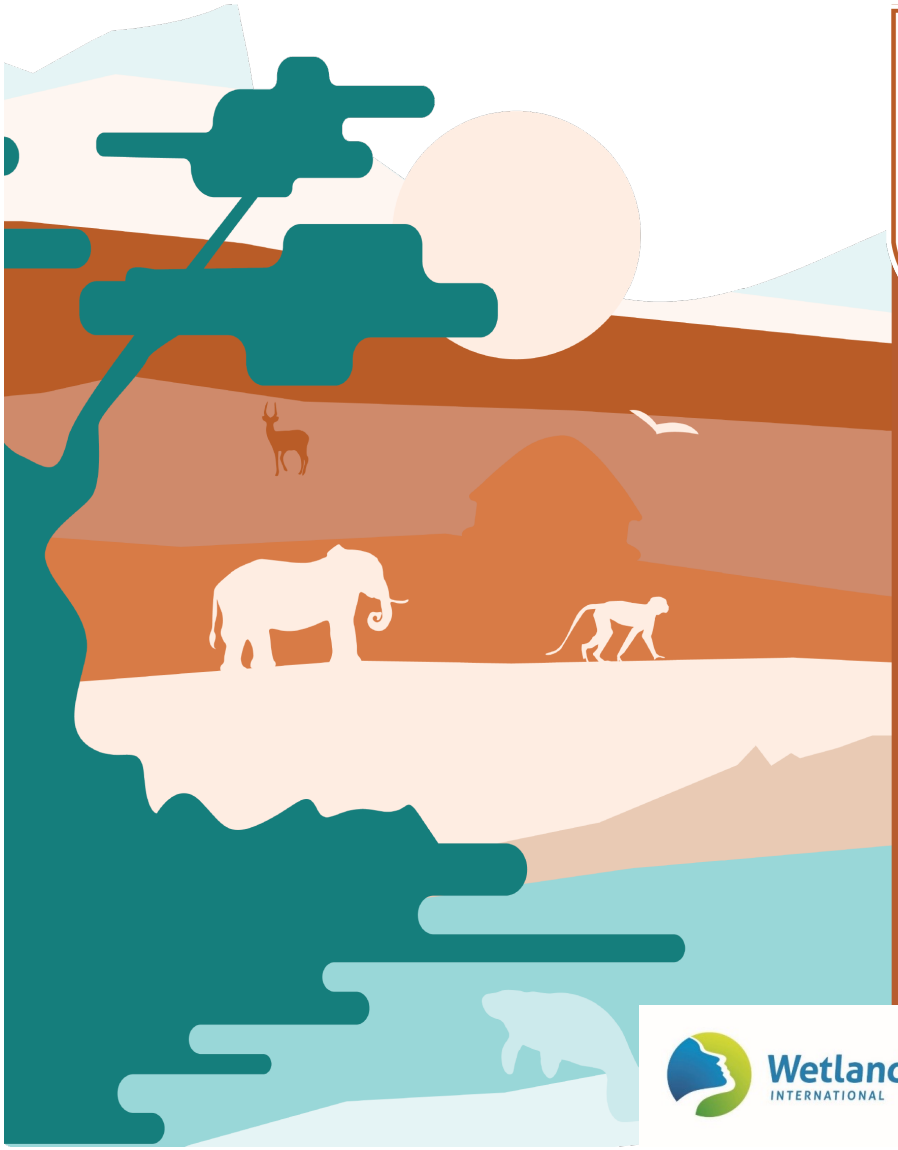

Water quality index for mangrove restoration in the Keta Lagoon Complex Ramsar Site, Ghana

Presented by:
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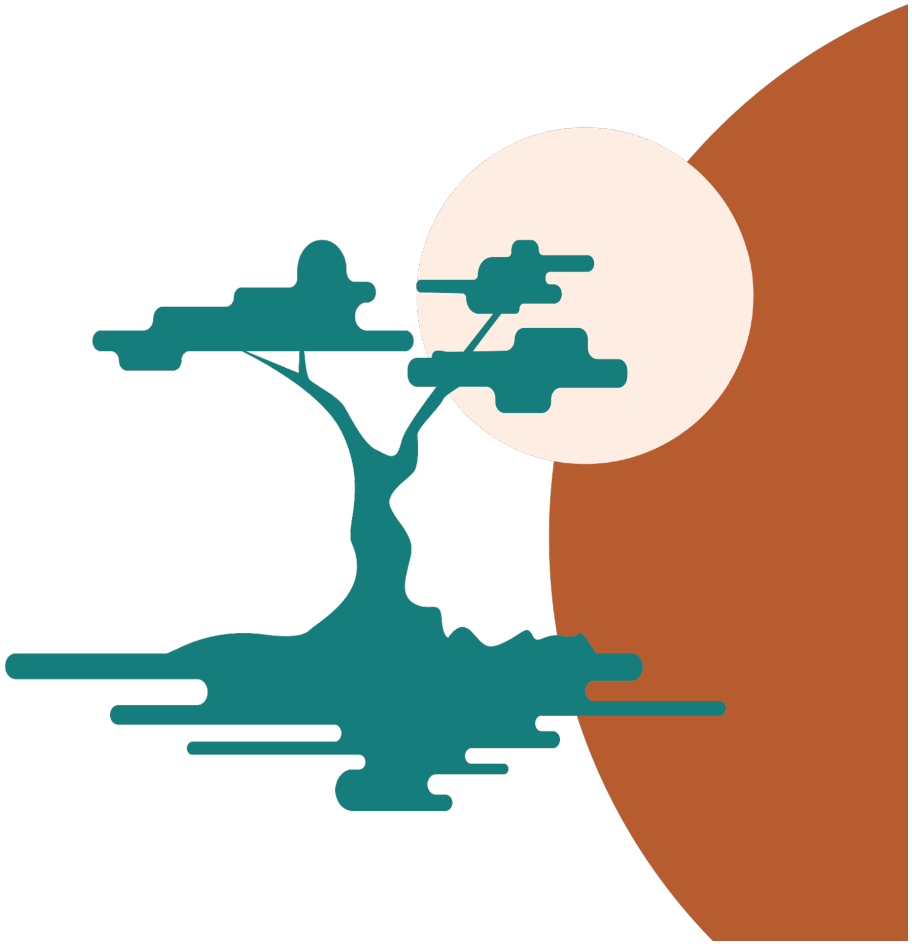
Presentation outline

- Background
- Problem statement
- Objective
- Methodology
- Results
- Conclusion
- References



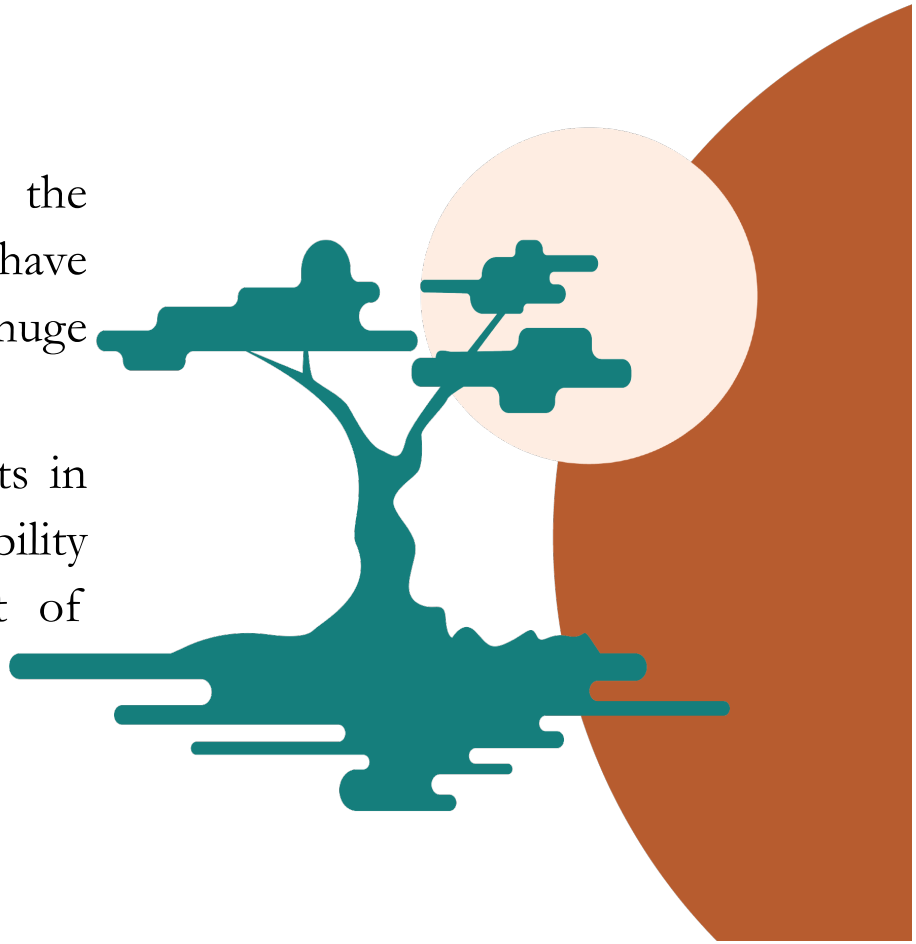
Background

- Determinants of mangrove forest success and distribution are varied and complex (Manson et al., 2003) and have long attracted scientific interest (Xu et al., 2020, Satyanarayana et al., 2010, Cunha et al., 2006, Jiménez, 1990, Hutchings and Saenger, 1987 and Walsh, 1974)

- Water quality is a major factor that influences mangrove ecosystems (Atwell et al., 2016; *Ardebili et al., 2006; Giri et al., 2007*)

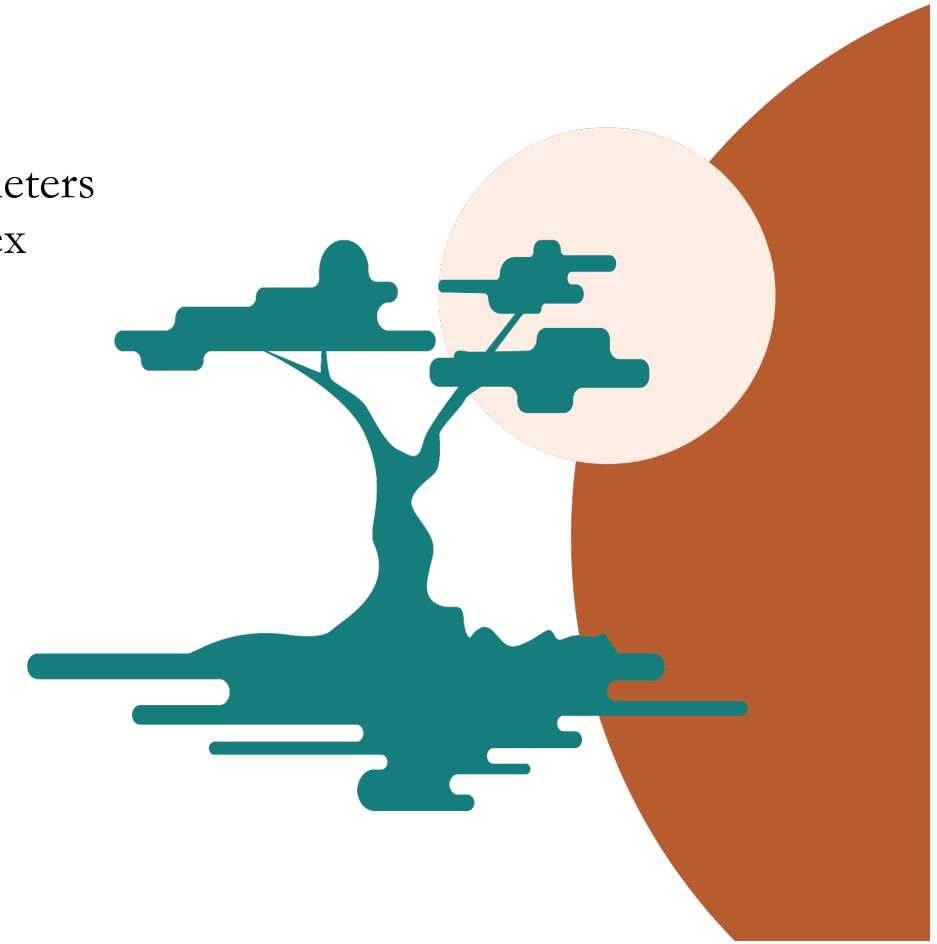
Problem

- Mangrove restoration/replanting projects in the Keta Lagoon Complex Ramsar Site (KLCRS) have seen mixed successes; sometimes resulting in huge losses
- Site selection for mangrove restoration projects in Ghana has largely been driven by land availability and not based on any scientific assessment of suitable conditions.

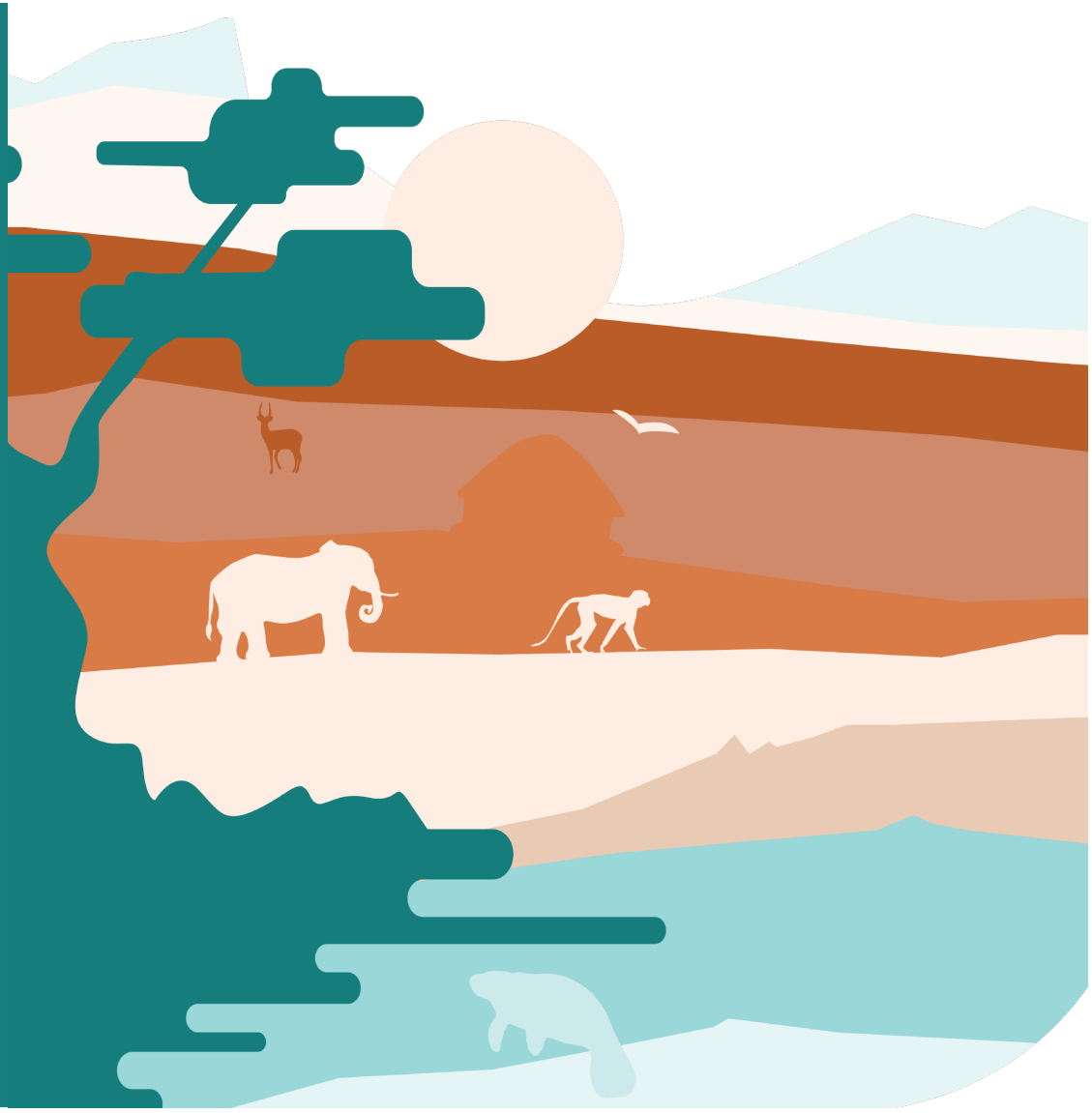


Objective

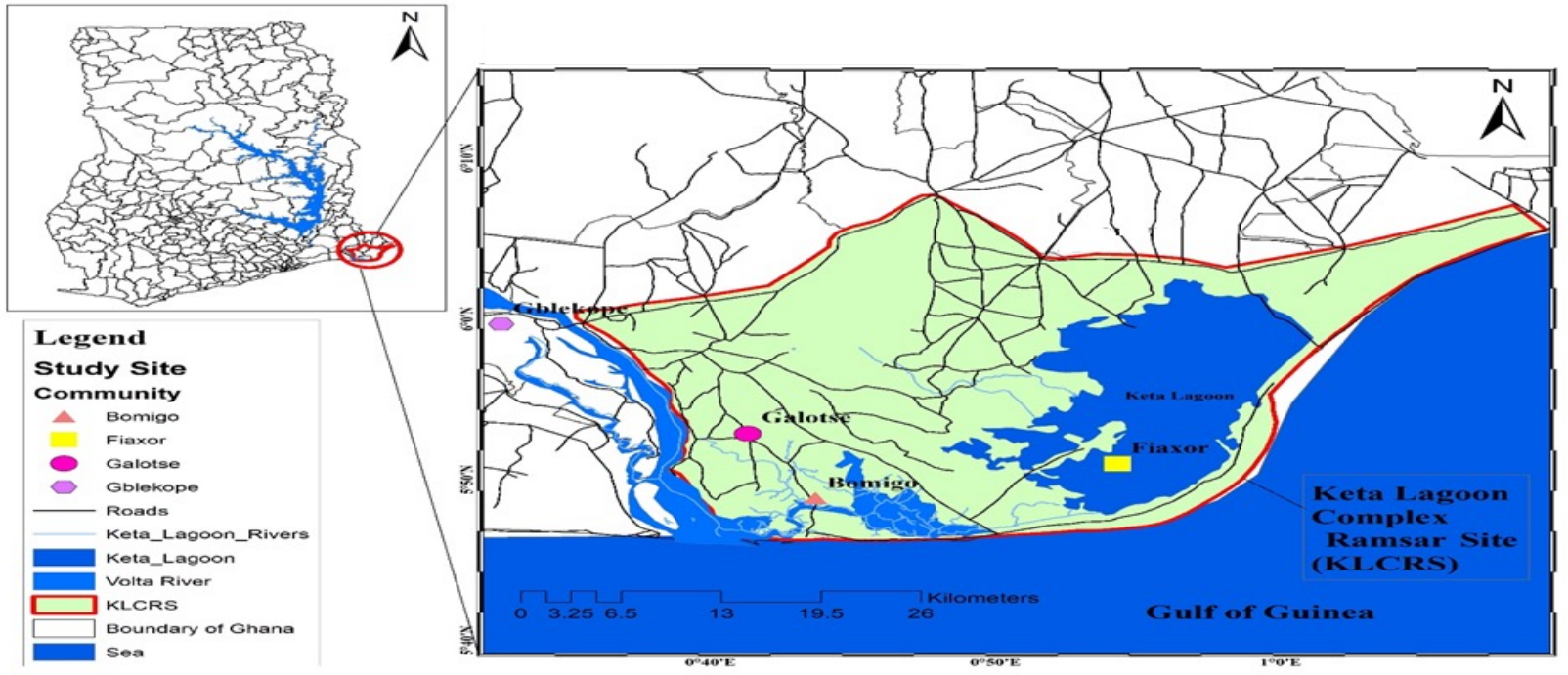
To identify areas with suitable water quality parameters for sustaining mangroves in Keta Lagoon Complex Ramsar Site (KLCRS)



Methodology



Methodology – Study Area



Methodology

To identify areas with suitable water quality parameters important for sustaining mangroves in Keta Lagoon Complex Ramsar Site (KLCRS)

Methodology – data collection

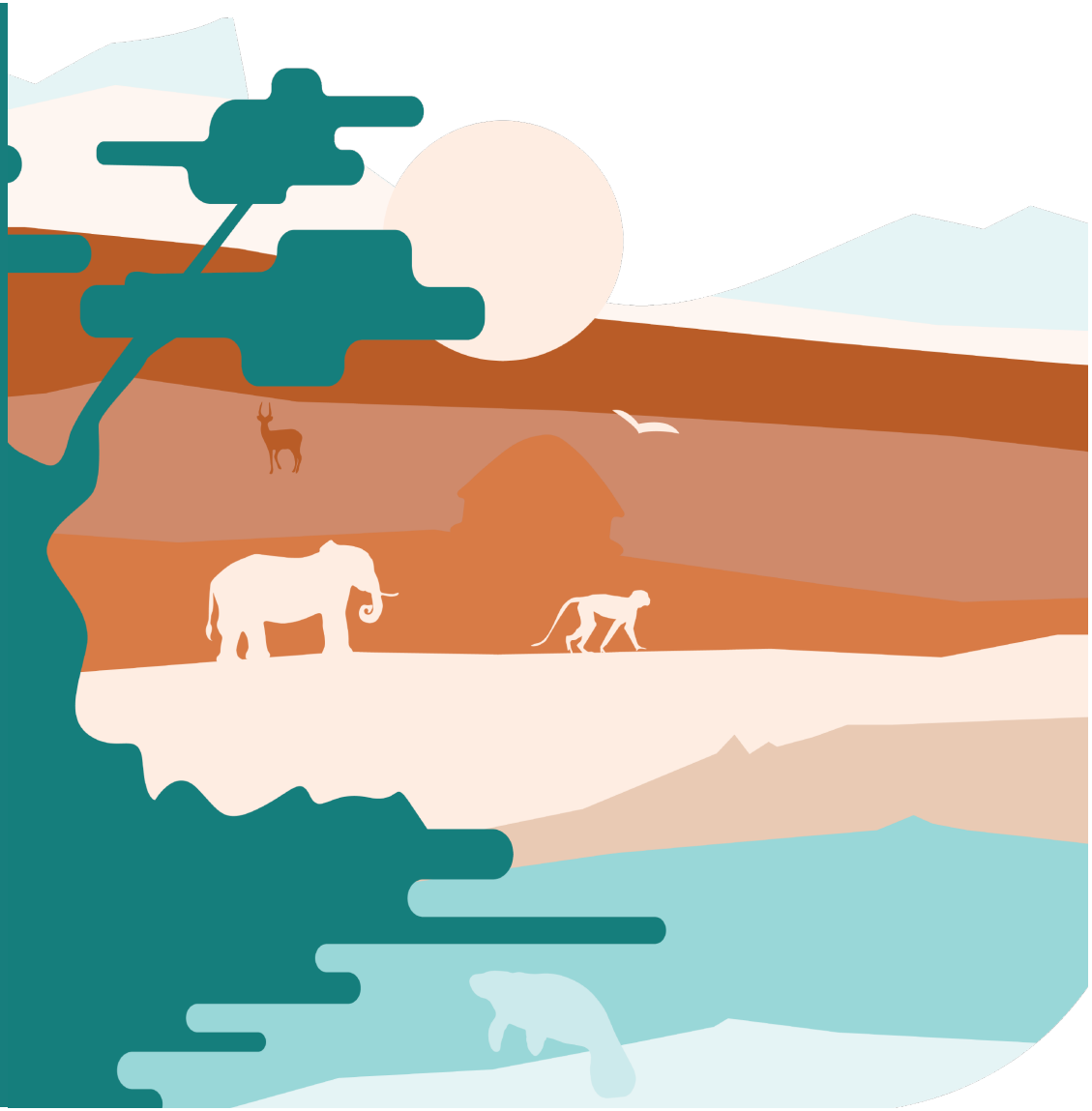
Water quality parameters

- pH
- Dissolved Oxygen (DO)
- Salinity
- Water temperature
- Electrical conductivity (EC)
- Total Dissolved Solids (TDS)
- In situ measurements were done using HACH multi-parameter probes

Methodology – data analysis

- PCA was performed on the raw data set comprising all the six (6) water quality parameters to identify the factors that contributed to the quality of mangroves in the Keta Lagoon
- Eigenvalues of 1.0 or greater were considered significant (Kim and Mueller, 1987)
- A one way analysis of variance was performed on the suitable water quality variable to examine statistical difference
- Differences were considered significant at a 5% level
- All analysis were executed in SigmaPlot version 14.0 and JMP software version 12.1.0 (SAS Institute Inc., Cary, NC, USA)

Results



Results

Table 1. Water quality variables from sampling points in KLCR with the corresponding PCA statistics

Parameters/Units	Components		
	1	2	3
pH	0.36	**0.62**	0.14
DO (mg/L)	**0.43**	0.54	0.07
Conductivity (µS/cm)	-0.52	0.30	0.20
TDS (mg/L)	0.40	-0.34	0.40
Temperature (°C)	-0.01	0.16	-0.84
Salinity (ppt)	-0.50	0.32	0.26
Eigenvalue	2.90	1.49	1.23
Percent of variance	47.75	24.75	20.51
Cumulative percent	47.75	72.50	93.50

Results

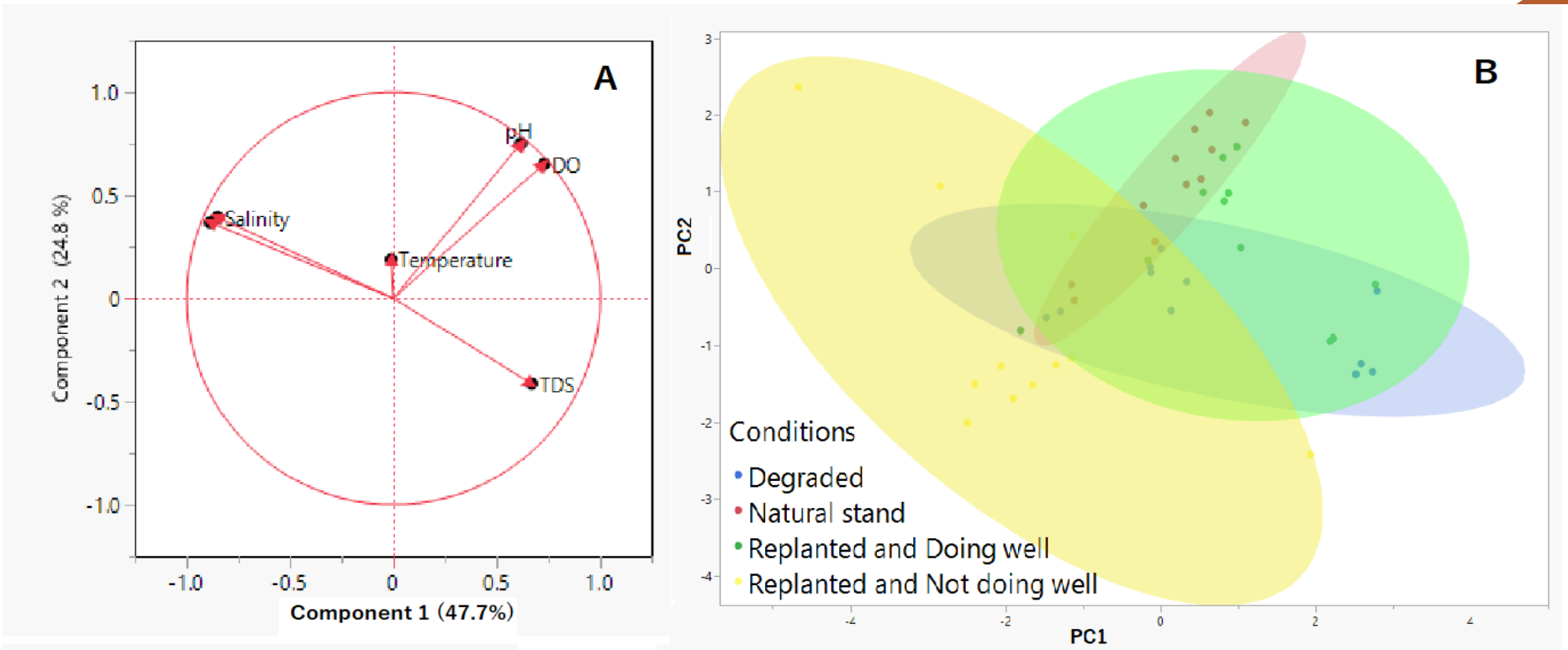


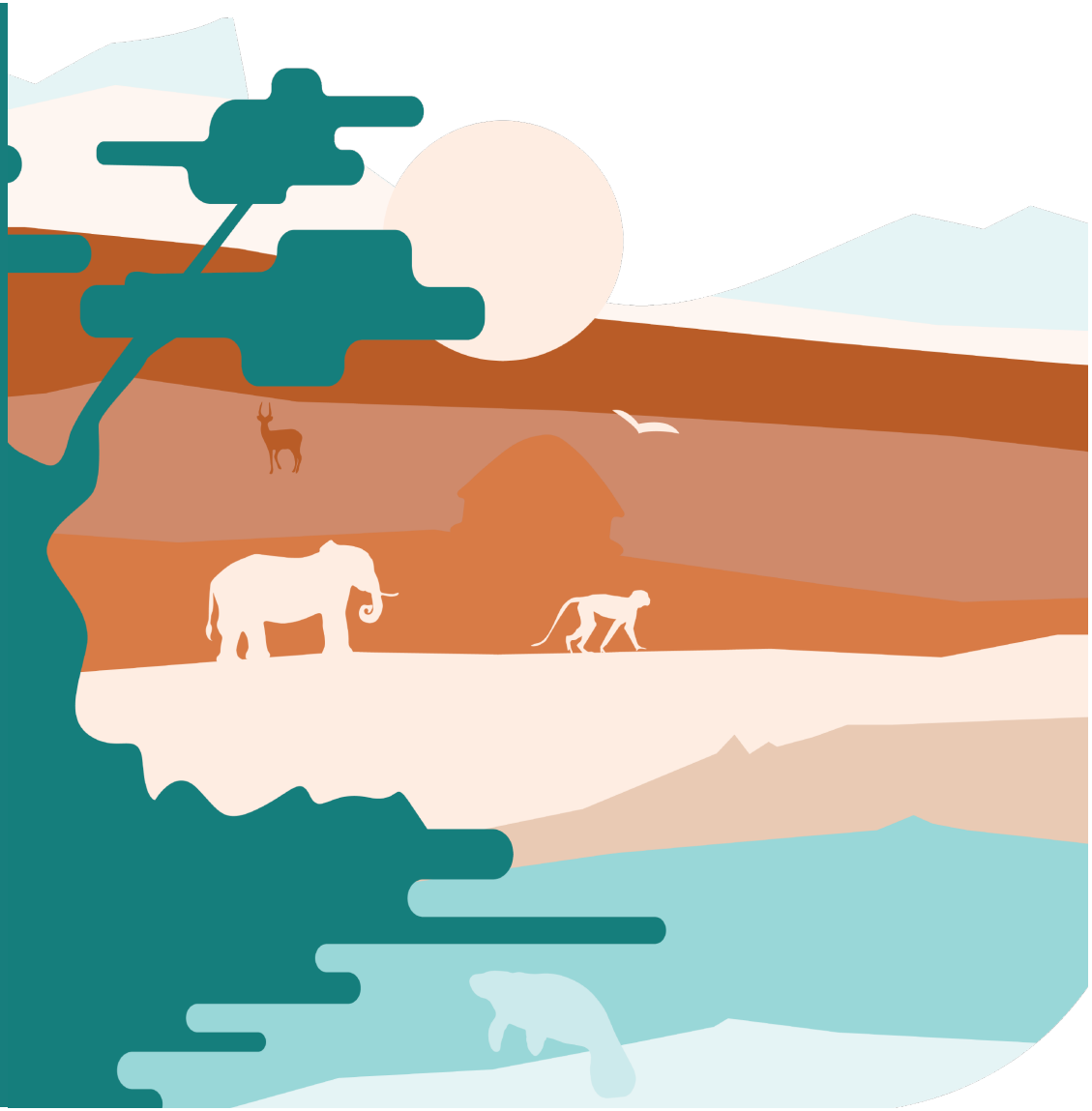
Figure 2. PCA of the six (6) water quality parameters to determine suitable variables for mangrove growth

Results

Figure 2. Important water quality parameters for mangrove restoration in the KLCRS

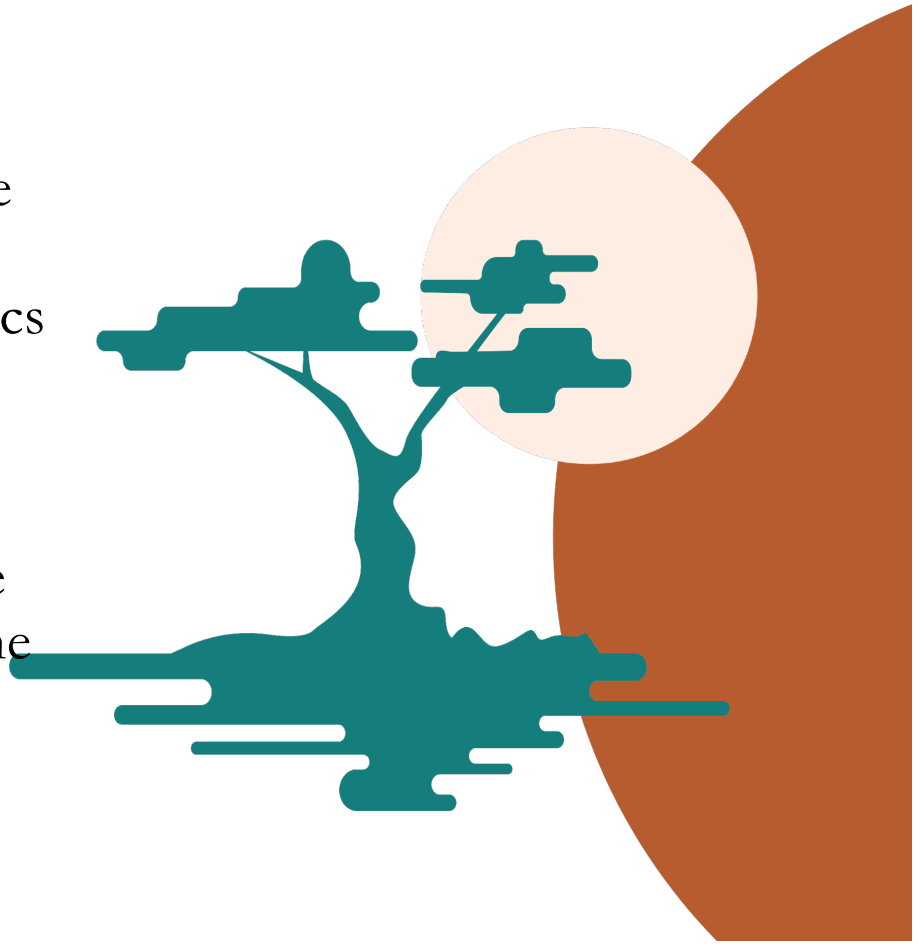
pH	Range	Mean	SD	p-value
Natural stand	7.6 - 7.9	7.8	0.1	<0.001
Degraded	7.6 - 7.9	7.7	0.1	
Replanted and Doing well	7.5 - 7.9	7.8	0.1	
Replanted and Not doing well	7.3 - 7.7	7.6	0.1	
DO				
Natural stand	1.4 - 3.1	2.6	0.5	<0.001
Degraded	1.3 - 2.9	2.2	0.5	
Replanted and Doing well	1.0 - 3.0	2.5	0.6	
Replanted and Not doing well	0.3 - 2.0	1.1	0.6	
Salinity				
Natural stand	13.4 - 14.7	14.1	0.4	0.002
Degraded	10.2 - 14.8	12.6	1.7	
Replanted and Doing well	11.4 - 13.7	12.9	1.1	
Replanted and Not doing well	10.3 - 24.8	15.6	3.7	

Conclusion



Conclusion

- The water quality parameters found by the study to have the highest influence on the mangroves in KLCRS from a PCA statistics were:
  - DO
  - pH
- Replanting programmes should make sure pH and DO of selected sites fall within the study ranges found in natural mangrove stands



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