Estimation of Chlorophyll-a on Lake Victoria Using Satellite Based Multi-Linear Regression Models

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Outline

- ❑ **Background**
- ❑ **Objectives**
- ❑ **Methodology**
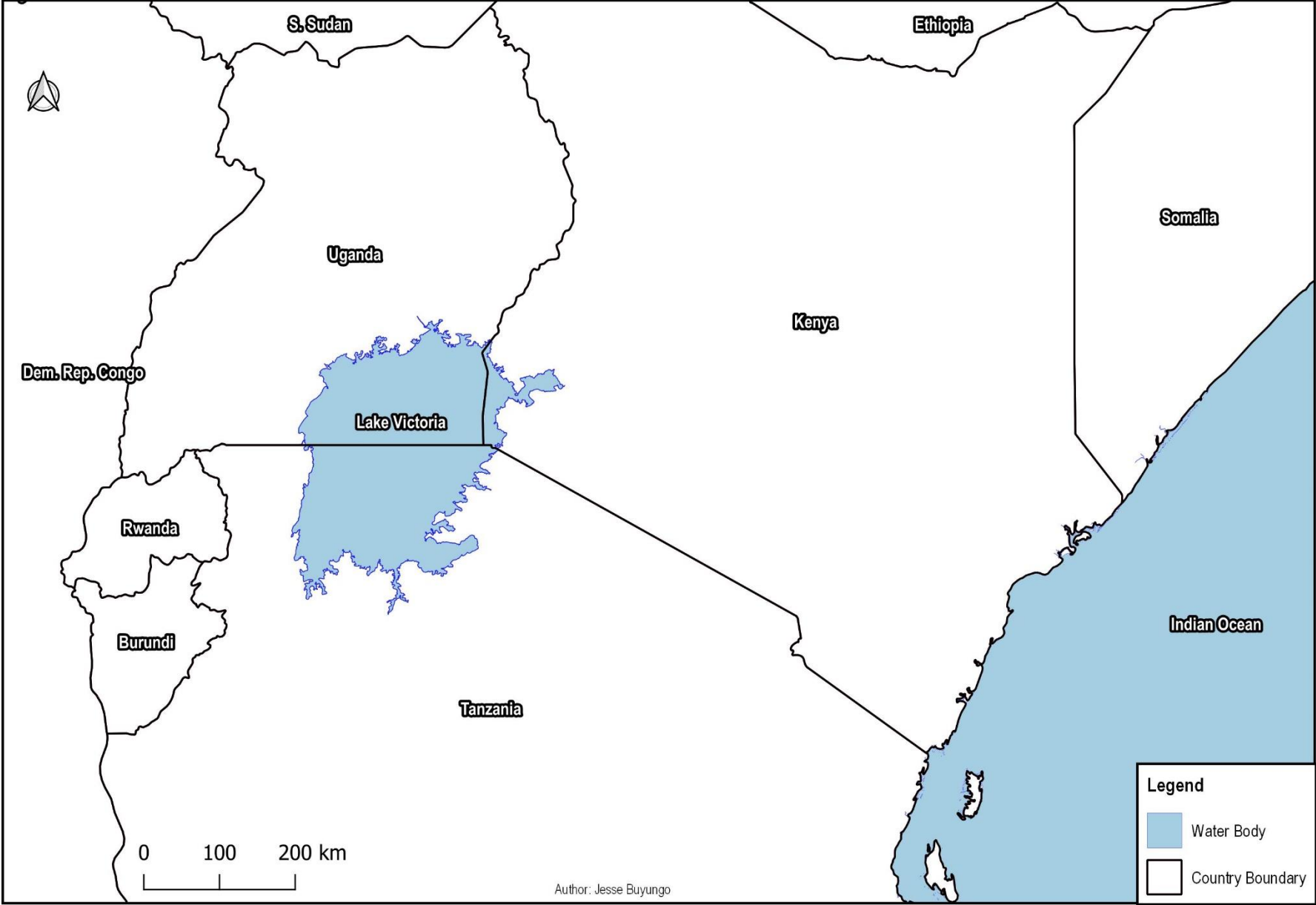- ❑ **Results**
- ❑ **Conclusion**
- ❑ **Beneficiaries**

Background

- Due to urbanization, increasing human population and associated activities around Lake Victoria,the water quality has continuously been affected by nutrient loads from industries, agriculture, sewage leading to algal blooms.

- Traditionally in situ measurements of Chlorophyll-a are used to measure and monitor this detoriation in water Quality.

- However, this process is laborious, time consuming, limited to time and space.

Background Cont…………

- We explored the use of Satellite Based (Landsat 8) multiple linear regression models in estimating this Chlorophyll a

- Because Landsat 8 imagery is

  ✓ Freely Available,

  ✓ synoptic coverage & regular collection

  ✓ Ideal Spatial Resolution (30m) for small inlets such as bays, landing sites over Ocean Colour Remote Sensors

  ✓ e.g. MODIS (250m), MERIS(300m)

A Map Showing The Location of Lake Victoria

S. Sudan

Ethiopia

Somalia

Uganda

Kenya

Dem. Rep. Congo

Lake Victoria

Rwanda

Indian Ocean

Burundi

Tanzania

0   100   200 km

Author: Jesse Buyungo

Legend

Water Body

Country Boundary

Objectives
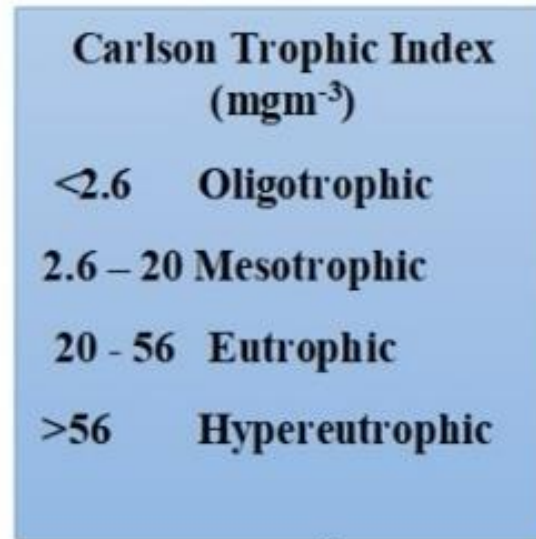
Main Objective

- To estimate chlorophyll a concentration on Lake Victoria using multi-linear regression Models based on Landsat 8 Imagery.

Specific Objectives

- To develop and determine the best model to estimate Chlorophyll-a from In situ measurements and Landsat 8 imagery.

- To determine the Lake Victoria's Trophic status
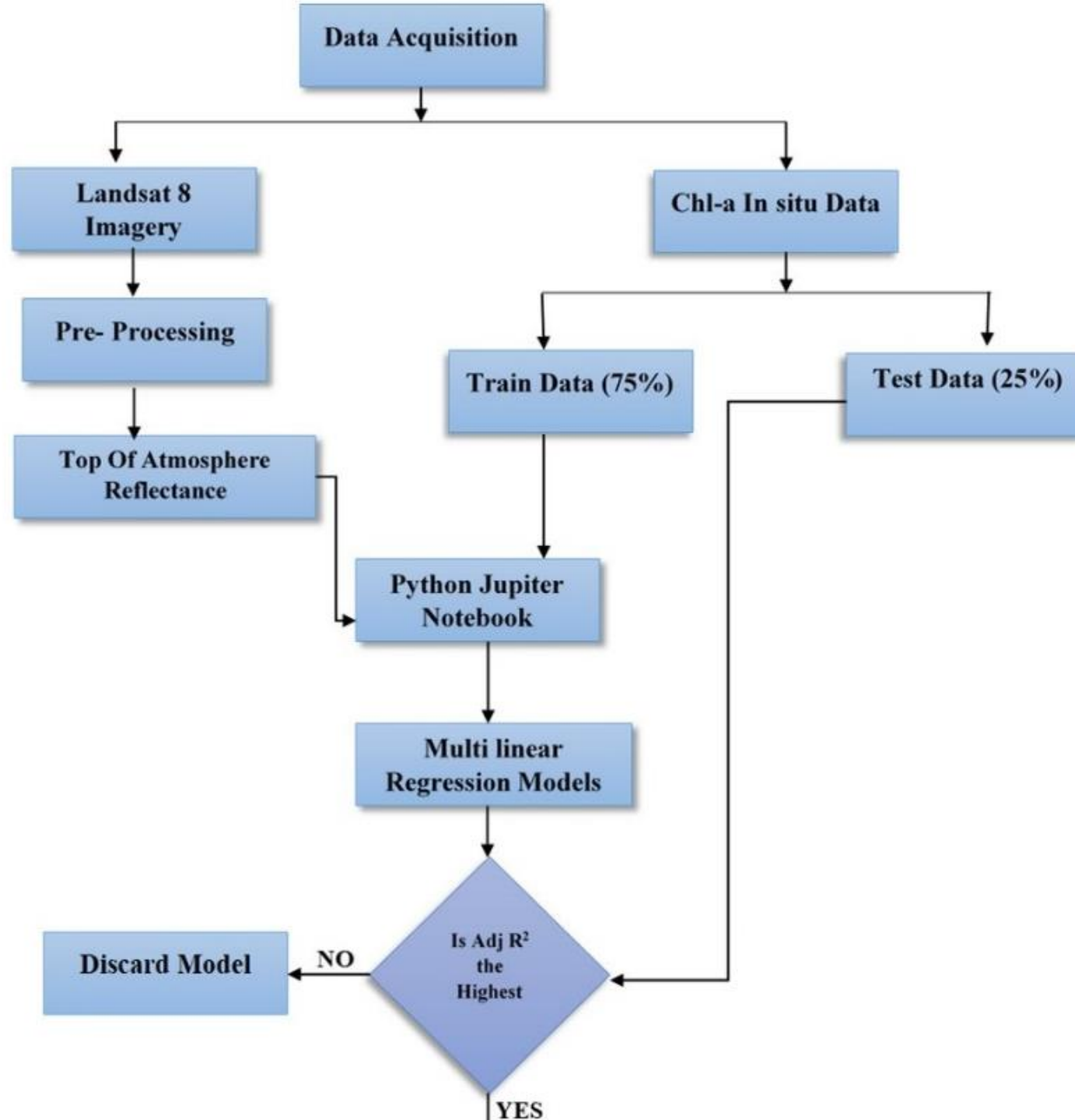
Results

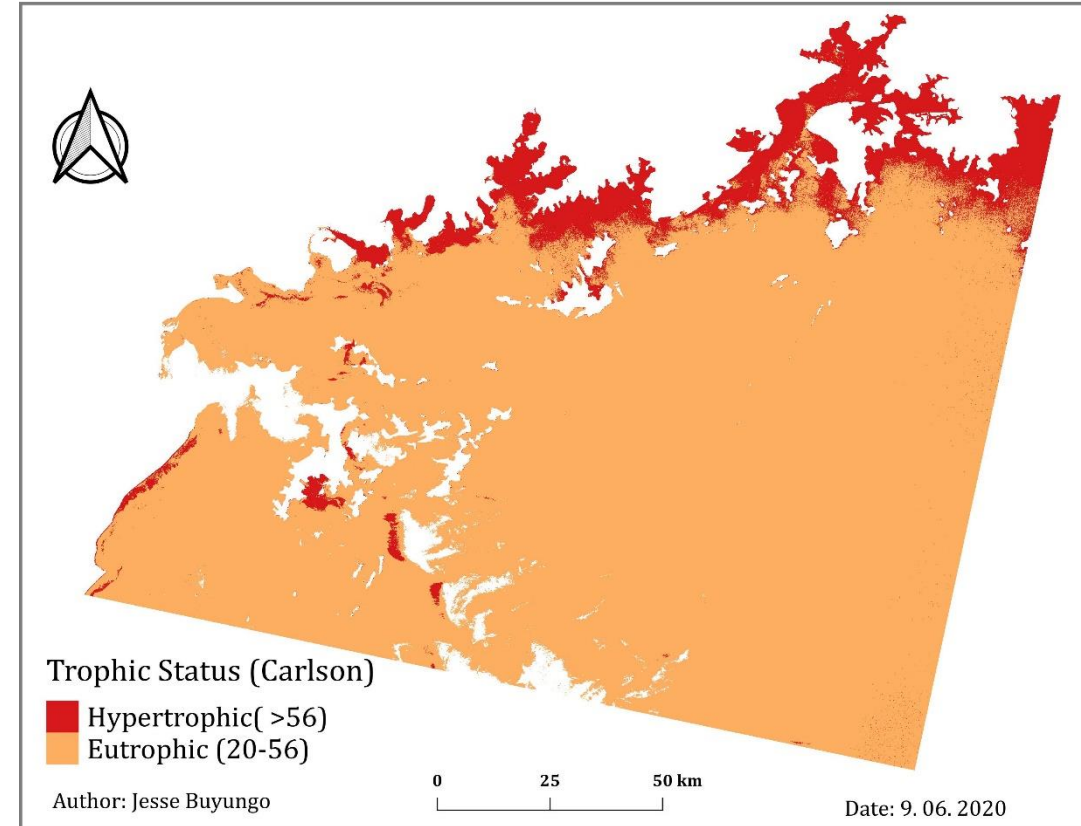| Multiple Linear Regression Model`	Model Number	R^2	RMSE	RPD(%)	Adj R^2
Log Chl-a = -129.048B1 + 18.068B2 + 54.834B3 + 50.248B4 -19.266B5 + 8.216	M_1	0.7635	0.7970	3.61161	0.3695
Log Chl-a = -129.899B1 +17.364.982B2 +56.355B3 + 29.501B4 + 8.604	M_2	0.7551	0.8111	3.15265	0.5102
Log Chl-a = -124.622B1 + 25.420B2 + 71.202B3 + 9.535B5 + 7.285	M_3	0.7517	0.8167	3.50136	0.3534

Best Model: Model M_2

Results

Modelled Chlorophyll-a Concentration on Lake Victoria

Chl-a (µgL-1)

0

300

0   25   50 km

Author: Jesse Buyungo   Date: 9. 06. 2020
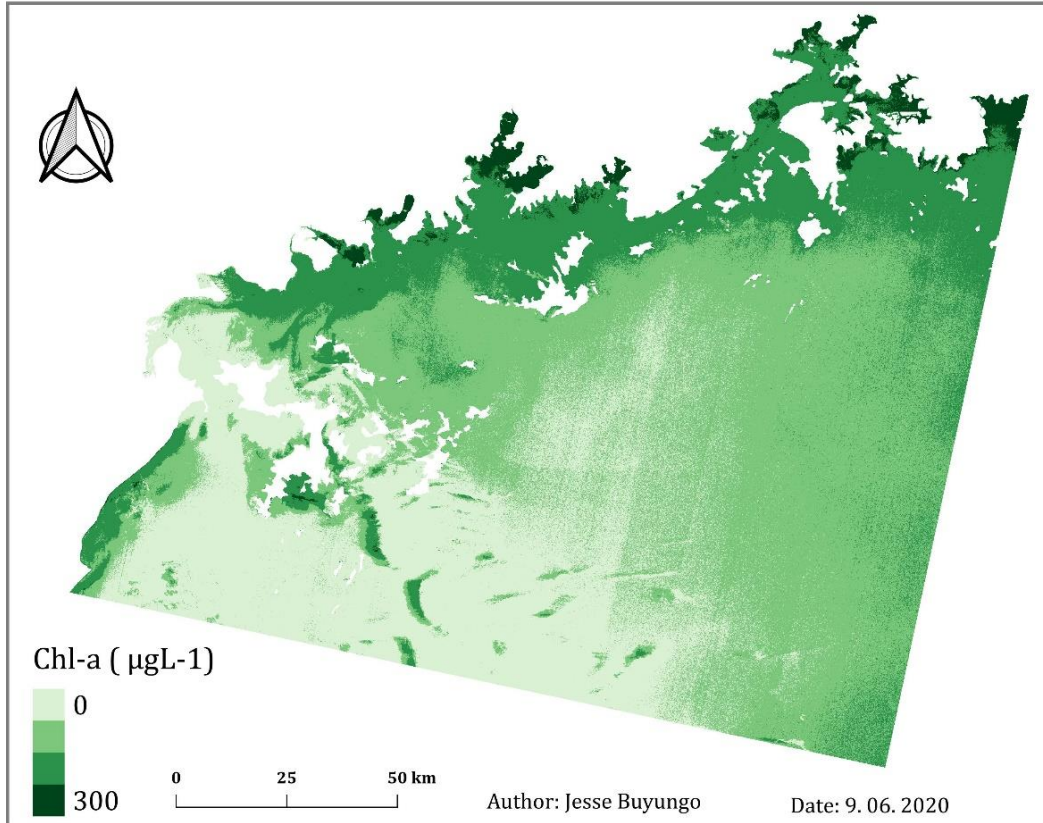
Lake Victoria's Modelled Trophic Status

Trophic Status (Carlson)

Hypertrophic(>56)
Eutrophic (20-56)

0   25   50 km

Author: Jesse Buyungo   Date: 9. 06. 2020

Conclusions

- Measures to reduce on the amount of nutrient inflow and discharge into the lake should be undertaken.

- More research should be carried out to develop Lake Victoria specific Chlorophyll-a retrieval Algorithms

Beneficiaries of this research

- National Water & Sewage Cooperation, Uganda

- National Fisheries Resource Research, Institute Uganda

- Ministry of Water and Environment, Uganda

- Other Researchers in Water Quality Modelling(World wide)

Merci Beaucoup

Questions?