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Background

In South Africa, the persistence of drought conditions has resulted in various water-adjustment policies in different provinces. The prolonged drought condition has created water stress environments affecting both crops and man. One of the provinces being hit by drought and water stress is the Free State Province [1,2]. Therefore, there is increased pressure on groundwater. Hence, this study aims to delineate groundwater occurrence and its patterns using Remote Sensing and Geographical Information Systems.

Study Area

The study area is the Free State Province (Figure 1). The province is located between the latitudes 26.6° S and 30.7° S of the equator and the distances 24.3° E and 29.8° E of the Greenwich meridian [2].

Methodology

The datasets to be used include soil, geology, lineaments, slopes, rainfall, land use pattern, geomorphology and drainage. Shuttle Radar Topography Mission (SRTM). Rainfall, geology and soil were obtained from relevant agencies while Landsat series were accessed from Google Earth Engine (GEE). Land use pattern was carried out using the Random Forest classifier in GEE (Figure 1) while Analytical Hierarchical Process was used to assign weights to the datasets.

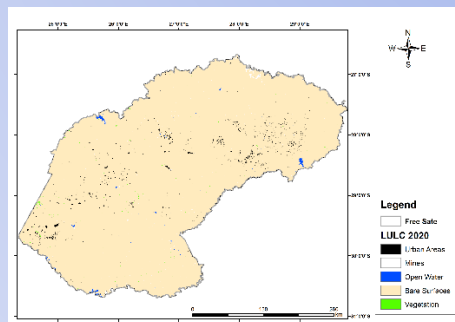


Figure 1. Landuse/Landcover for Free State Province

Result and Discussion

Geology is ranked the highest weight, closely followed by rainfall. These two variables to a large extent determine groundwater recharge. The pattern of distribution of groundwater can be seen in Figure 2. High probabilities are around NE, SE areas of the province (Figure 2).

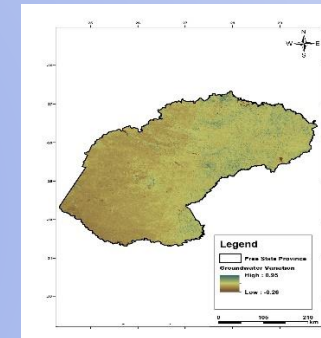


Figure 2. Groundwater distribution across Free State Province

Conclusion

The importance of GIS and RS techniques cannot be overemphasized for improved planning and water-adjustment policies.

References

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2. Orimoloye, I. R., Belle, J. A., Olusola, A. O., Busayo, E. T., & Ololade, O. O. (2021). Spatial assessment of drought disasters, vulnerability, severity and water shortages: a potential drought disaster mitigation strategy. *Natural Hazards*, 105(3), 2735-2754.