Remotely sensed delineation of groundwater dependent ecosystems in Khakhea-Bray Transboundry Aquifer

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Introduction

• Groundwater Dependent Ecosystems (GDEs) provides critical socio-economic and ecosystem services

• Socio-economic:
  • household
  • industrial
  • agricultural use

• Ecosystem services:
  • water purification
  • provide habitat for fauna (Hayos et al., 2016; Doody et al., 2019)
Introduction (continued)

- Information such as location and delineation of GDEs is scarce particularly in Southern Africa

- GIS + remote sensing > useful for mapping GDEs

- Thus the study aims to identify, delineate and map GDEs at Khakhea-Bray Transboundary Aquifer using multi-source spatial data
Objectives

1. To identify and delineate Groundwater Dependent Ecosystems spatial extent using geospatial techniques in Khakhea-Bray Transboundary Aquifer

2. To determine spatio-temporal changes of Groundwater Dependent Ecosystems over time (1995-2021) in Khakhea-Bray Transboundary Aquifer
Aims and objectives (continued)

3. To investigate the precipitation and climatic variability influences on Groundwater Dependent Ecosystems in Khakhea-Bray Transboundary Aquifer

4. Evaluate and map chlorophyll-a concentration in Groundwater Dependent Ecosystems during 2020 and 2021 as a proxy for water quality in Khakhea-Bray Transboundary Aquifer
Methods
Methods (continued)

• The study took place in the Khakhea-Bray Transboundry Aquifer that is located on the borders of South Africa and Botswana

• 24\textsuperscript{th} to 26\textsuperscript{th} of June 2021

• GPS coordinates points for different types of land covers
  • Water
  • Shrublands
  • Bare surface
  • Build-ups
  • Trees
Methods (continued)
Methods (continued)
Methods (continued)
Objective 1 (continued)

Proposed

• 1. To identify and delineate Groundwater Dependent Ecosystems spatial extent using geospatial techniques in Khakhea-Bray Transboundary Aquifer.

Results

• Identification achieved-experts
  • Pans (wet and dry)
  • Spring
  • Wetland
• Delineation
  • NDVI
  • NDWI
  • DEM
Literature search (in progress)

• Progress>challenges>future opportunities

Few studies on GIS and RS application on GDEs (arid and semi-arid)

Progress: Since 2000

Focus: Wetlands (Münch and Conrad, 2007; Barron et al, 2014; and Wu, 2018)

Aspects: water quality; water level; identification; change in cover; species diversity; evapotranspiration; relationship among climate variables (White et al., 2015; Dabboor and Brisco, 2018)
The application of satellite data on GDEs studies
Literature search (continued)

• Methods
  ➢ Satellite images from multispectral satellite images
    ➢ Widely used multispectral satellite images (Landsat)
  • Characteristics:
    • freely available
    • repeated global coverage
    • wide swath-width (above 185 km)
    • covers a large area
Literature search (continued)

➢ Algorithms or techniques

• Widely used: Image classification (supervised); and vegetation (NDVI) and water (NDWI) indices

• NDVI – used for GDEs delineation (principle: greener vegetation, potential GDEs) (Pérez Hoyos et al., 2016)

• Produce better results when integrated with other aspects like DEM
Way forward

• Submit first Literature review draft to the supervisors and journal on the 30\textsuperscript{th} July 2021 and October 2021, respectively.

• Data collection for wet season-comparison

• Analyse collected data
THANK YOU