

Spatiotemporal analysis of land use /cover changes and urban expansion in Lusaka City, Zambia

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Introduction

Lusaka, the capital city of Zambia, has been experiencing rapid urban growth. Rapid urbanization has caused rapid

Land use/over (LULC) changes. The purpose of this study was to investigate the spatiotemporal pattern and processes LULC changes and urban expansion in Lusaka City, Zambia. Methodology Results

LULC Classification

 Data - Landsat TM & ETM+; Period - 1990, 2000, 2010; Method - Maximum Likelihood Classification; Software - ENVI 5.2.

Landscape Change Dynamics

 Selected landscape level spatial metrics generated in FRAGSTATS. (LPI- Largest Patch Index; PD -Patch Density; MPS - Mean Patch Size; LSI -Landscape Shape Index; IJI - Interspersion and Juxtaposition Index; AWMPFD - Area Weighted Mean Patch Fractal Dimension); CONTAG - Contagion ; COHESION)

Urban Sprawl Analysis

- Method Shannon Entropy(Hn) which measures the compactness or dispersion of urban/built up area.
- Equation: $H_n = -\sum_{i=1}^n P_i \log(1/P_i)$ where P_i is the proportion of the variable (e.g. built up area) in the ith zone. Hn values range from 0 to log n; values closer to 0 representing compactness and values closer to log n representing dispersion.
- Sprawl reference zones

Results

ercent 30

20

10

Urban/Built

Woodland

Grass/Shrub

Land

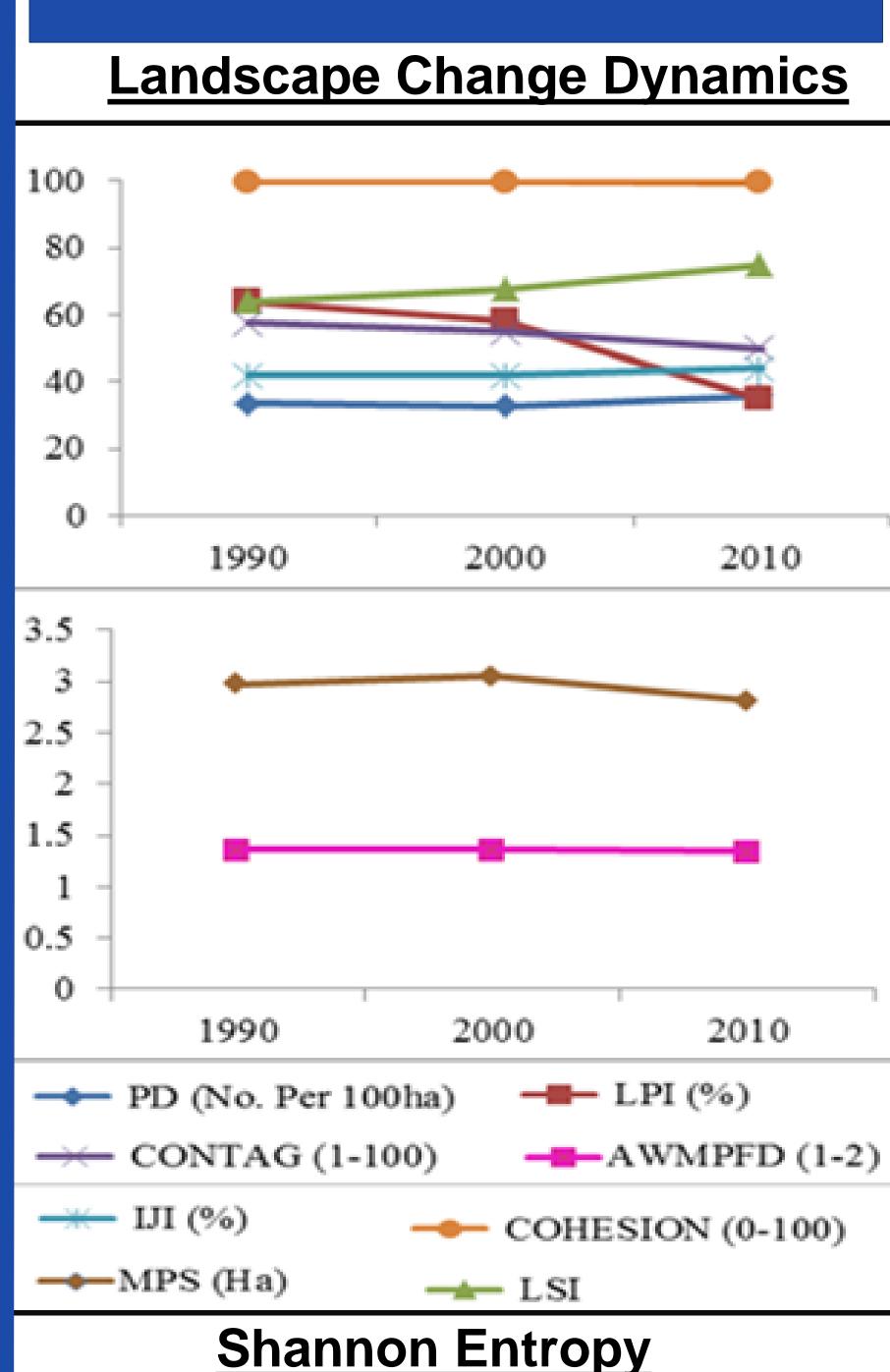
Cultivated

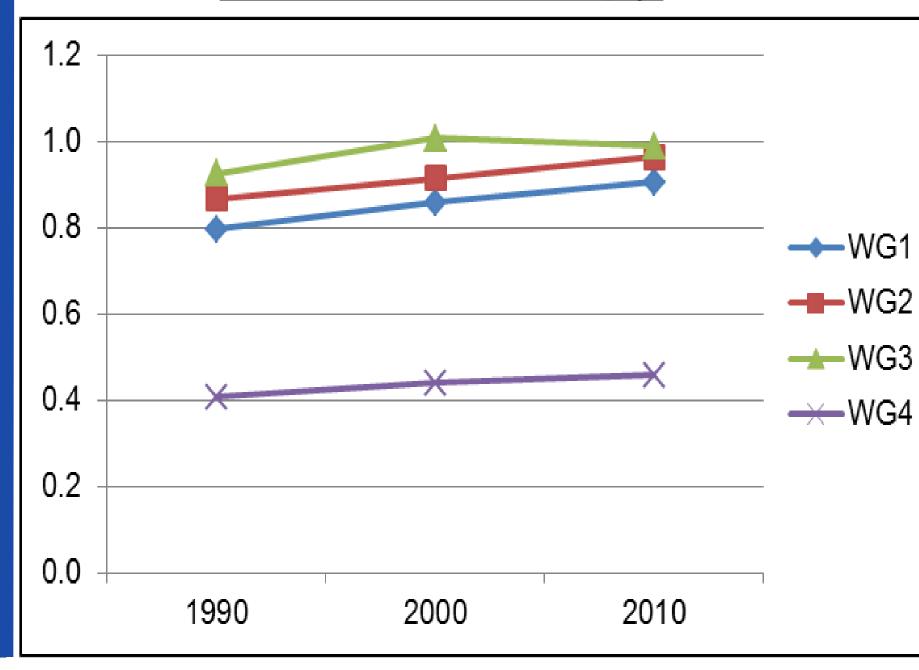
Land

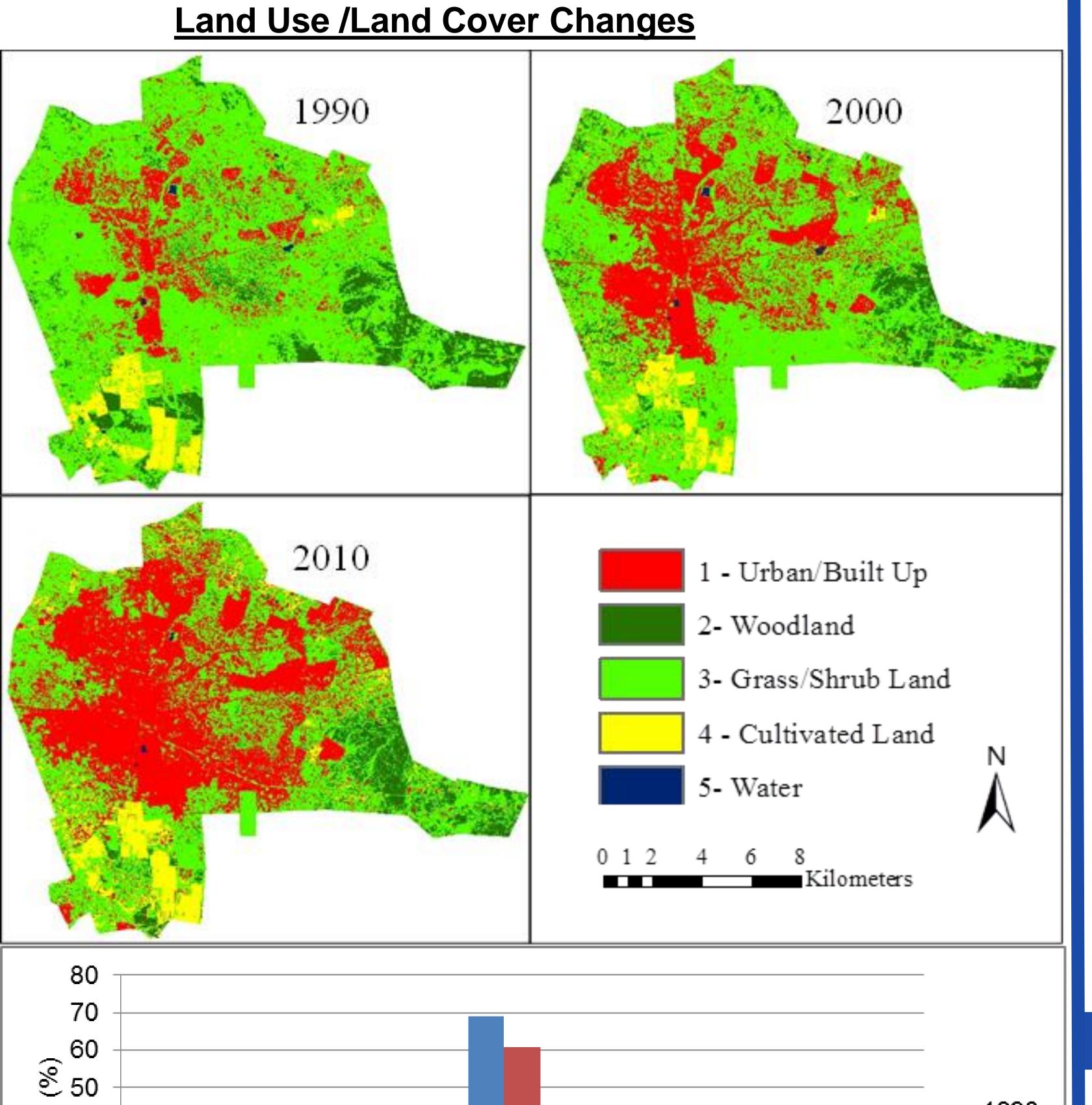
Water

- (1) Ward Groups (WGs) grouped based on built area composition.
- (2) Distance to Location Factors: city center, major roads, major markets and rail station.

Obtain Satellite Ancillary Data Images Topo Sheets LULC Classification Geo-Referencing LULC Maps Digitizing Layers 2010 City and ward City Center boundaries 2000 Major Roads Cadastral data Rail Stations land use 1990 Major Markets LULC Change Overlay all layers Analysis Urban Sprawl Landscape Extract Built Change Dynamics Analysis Up Areas Spatial Metrics Shannon Entropy Analysis of Results







Distance to Location Factors S 100 8 density 50 2000 80 2000 -----2010 ____2010 40 fi 20 Built Built 10 10 12 14 16 18 20 22 1500 2500 3500 4500 5500 6500 City Center Major Roads S100 S ----1990 area density -----1990 80 ____2000 density ____2000 ___2010 ___2010 60 area ďη Built ď 20 Built 14 16 18 20 22 Major Markets Rail Station

Conclusion

1990

2000

2010

- Built Up area increasing at rapid rate dominated by unplanned areas.
- Landscape fragmentation increasing and becoming more heterogeneous.
- Entropy shows increased and continued dispersion of the landscape urban sprawl evident.