

# The Urban Transition in Ghana and Its Relation to Land Cover and Land Use Change Through Analysis of Multi-scale and Multi-temporal Satellite Image Data

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Study Period 1986 – 2014; emphasis c. 2000 to c. 2010



# Project Objectives

1. Identify, map, and quantify land cover and land use change (LCLUC) within an extensive study area in Ghana, particularly for the period 2000 through 2010.
2. Understand the regional impacts of LCLUC associated with rural-to-urban migration in driving these changes.
3. Assess LCLUC and its effect on demographic and quality of life factors for four major cities during this time period.

# Research Approach

- Map and quantify LCLUC at:
  - (1) inter-regional scale for the Greater Accra, Central, and Ashanti regions of southern and central Ghana, and
  - (2) intra-urban scale for Accra, Kumasi, Cape Coast and Obuasi.
- Inter-regional LCLUC based on moderate spatial resolution data Landsat ETM+, Terra ASTER and SPOT HRV optical satellite systems, and ERS-2 synthetic aperture radar (SAR).
- Intra-urban LCLUC based on high spatial resolution image data from QuickBird, WorldView, IKONOS and Geoeye commercial satellites.

## Research Approach (cont.)

- c. 2000 through 2010 study period coincides with a period of available demographic and health survey data for Ghana (e.g., Ghanaian census, Demographic and Health Survey and Women's Health Survey)
- Utilize quantitative spatial analysis techniques to examine relationships between LCLUC and magnitudes and changes of demographic, socioeconomic, and health variables.
- Emphasis on effects of LCLUC on quality of life indicators e.g., child mortality, slum indices, and food security, within four of the major cities of Ghana.

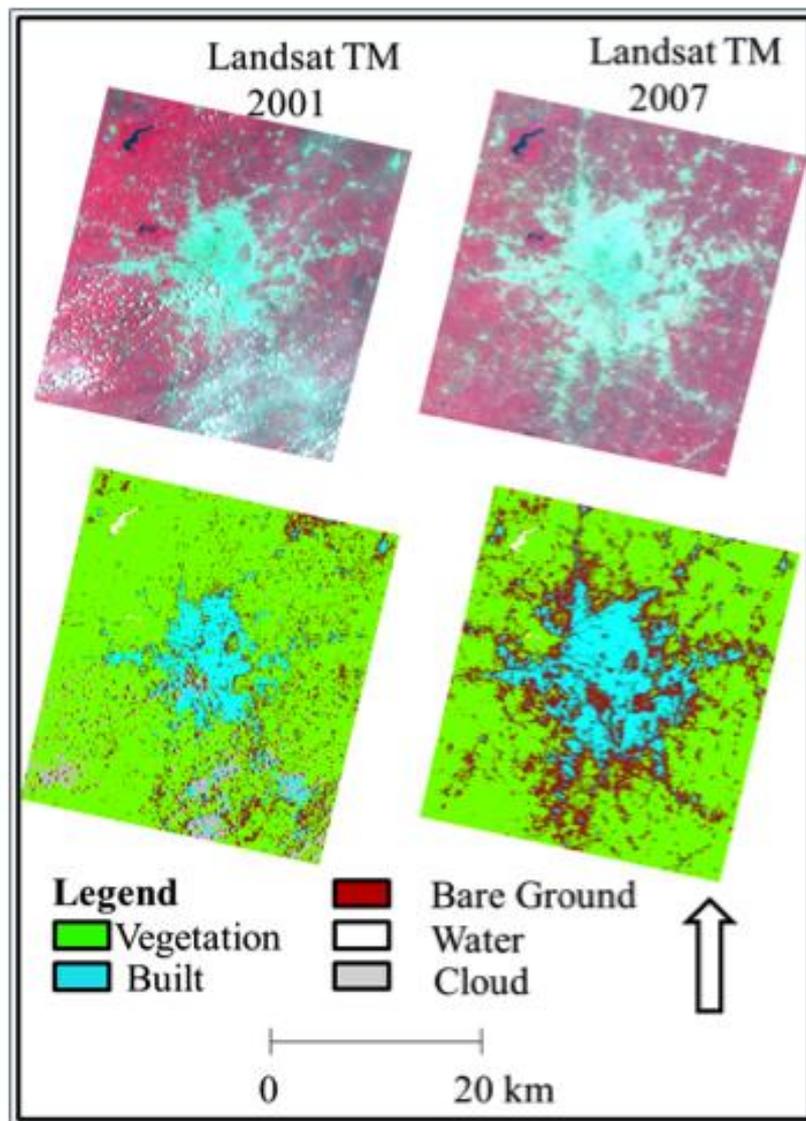


Figure 4. Preliminary evaluation of LCLUC for greater Kumasi area between 2001 and 2007 based on classification of Landsat ETM+ data. “Built” land cover increased substantially particularly in northern and eastern Kumasi, where high spatial resolution satellite image data are available for more detailed analyses.

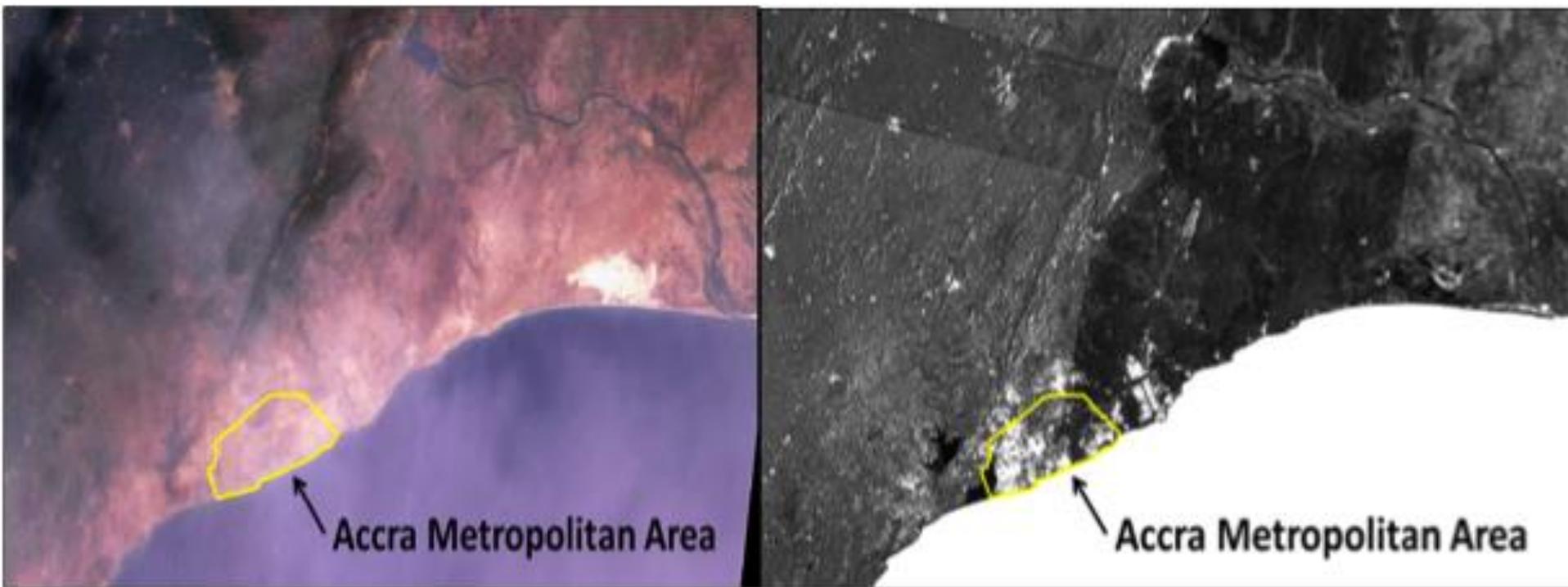


Figure 3. Landsat 7 ETM+ image and ERS-2 “SAR Precision” radar images from circa 2000. SAR data are particularly useful for identifying “Built” and Agricultural LCLUC in rural and peri-urban areas.

# Low socio-economic status neighborhoods

Low % vegetation & size; high % impervious & size

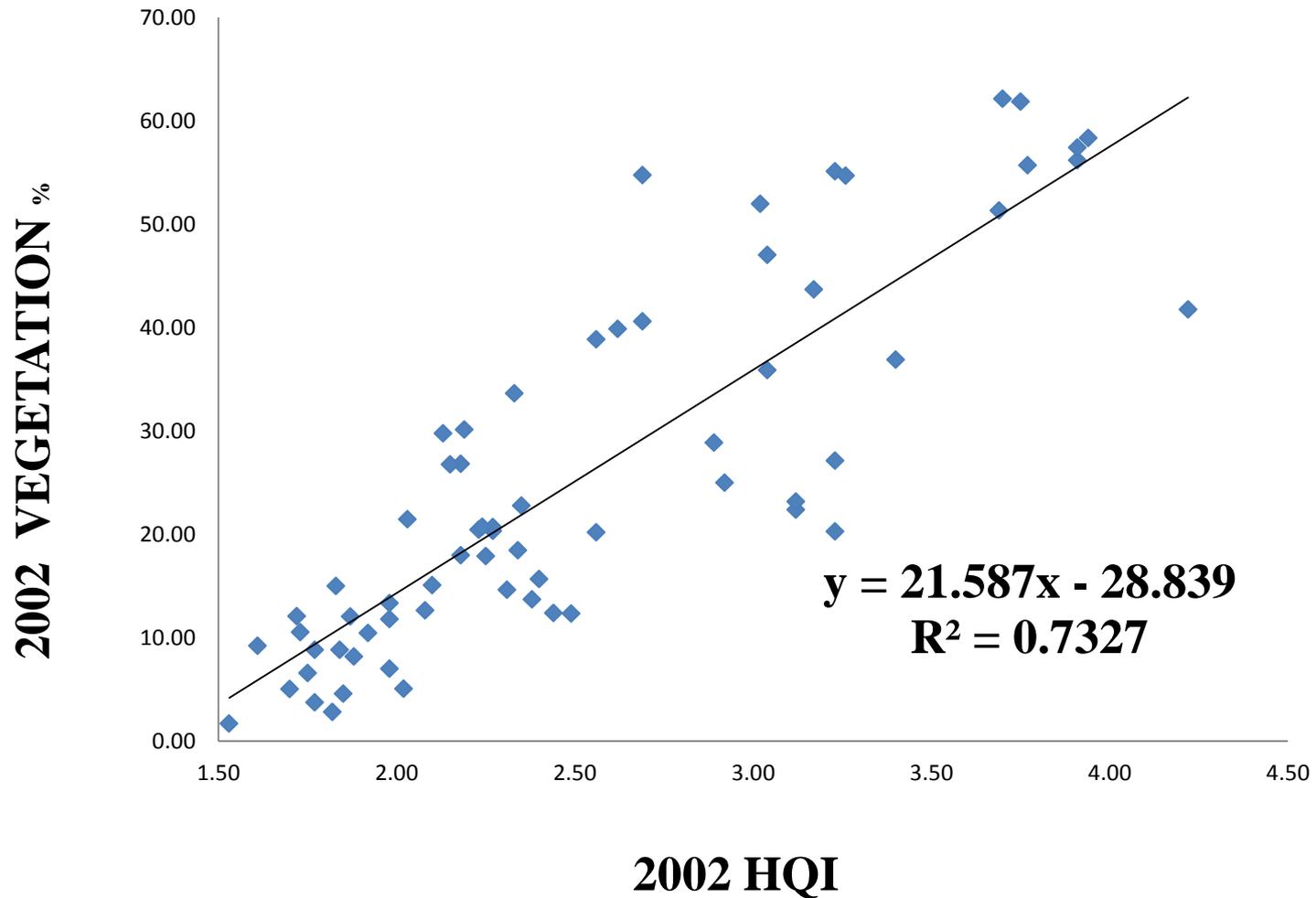


# Moderate/high socio-economic neighborhoods

Greater % vegetation & size; lower % impervious & size



# Housing Quality Index (2000 Census) vs. % Vegetation (2002 QuickBird) --- Neighborhoods in Accra, Ghana



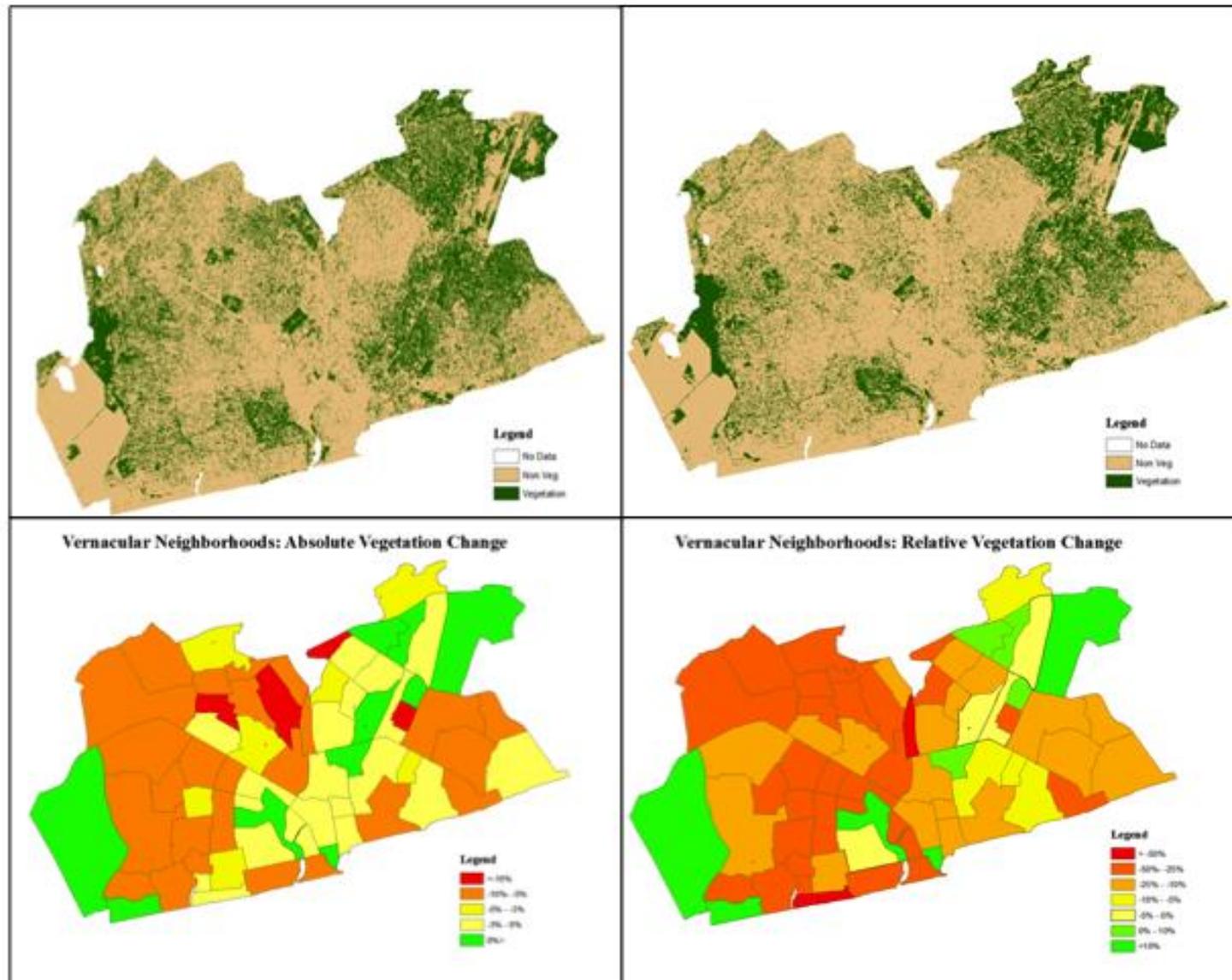


Figure 5. Vegetation change between 2002 and 2010 derived from classification of QuickBird multispectral data. A seven percent area-wide decrease in vegetation cover occurred in this period, with greatest relative decrease in slum areas.

# GEOBIA -- Post-classification Comparison



2002 QB subset



2010 QB subset



Delineated New Buildings

# Different view angles and rooftop materials; shadow effects

2002



2010

