

**AN ANALYSIS OF LAND COVER CHANGES AND
LAND FRAGMENTATION ALONG SOUTHERN
EXPRESSWAY**

P. D. Wijsekara

198532E

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Department of Town and Country Planning
Faculty of Architecture

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DECLARATION

I declare that this is my own work and this thesis/dissertation does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

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Name of Supervisor:

Signature of the Supervisor:

Date:

DEDICATION

This research work is dedicated to my alma maters,
Sacred Heart Convent, University of Sri Jayewardenepura,

University of Moratuwa

&

to my life partner who has been a constant supporter during the tenure of my
post-graduate degree.

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ABSTRACT

Land use and land cover change, land fragmentation as well sustainable use of land resource has become a crucial topic during the twentieth century with the need on infrastructure development. The Southern Expressway Development Project (STDP) is one of mega infrastructure projects implemented in Sri Lanka. This study investigated LULC changes and land fragmentation occurred due to STDP by utilizing Geographic Information System (GIS) and Remote Sensing (RS) techniques. The study was based on 5km buffer from the first phase of the STDP between 2001-2021. ArcGIS 10.8 and FRAGSTATS 4.2 were mainly used for change analysis and identifying the fragmentation. Landsat 8 images (path-141 and row-055 and row-056, with less than 10% cloud cover and of 30m-by-30m spatial resolution) were obtained from US Geological Survey's Natural Resources Observation Terminal Database website (<https://earthexplorer.usgs.gov>) for both years. Seven land classes were identified using supervised image classification. The overall accuracy of the images were 84% in 2001 and 85% in 2021. Analysis depicted that natural vegetation and urban/ road has increased significantly along the expressway, while cultivated lands, paddy lands and homesteads were decreased by 5%, 7.73% and 6.44% respectively. Water areas do not depict a considerable change. Transfer Matrix depicted that 11066.14 ha of cultivated lands were transferred to natural vegetation. While large amount of paddy lands was converted into cultivated lands (8530.64 ha) and natural vegetation (7218.78 ha). The land use variation rates of urban and road and barren lands were the highest and the variation rate of cultivated land (-12.37%) was the lowest. Results obtained through FRAGSTATS analysis revealed that patch density of the area was increased from 112.57 to 169.42 by the time and number of patches of the overall landscape was increased by 58459. Class level analysis revealed though the natural vegetation and urban lands increased by the total area, both land uses were highly fragmented. Area means of the all the land uses were also reduced. The expressway has differently affected the land uses on the regional scale considering the interchange level analysis. Accordingly, the study concludes that findings of the study are valuable for urban planners in two fronts. On one hand the study provides quantitative analysis of the impact of STDP of land use and land cover changes. On other hand the GIS & RS based method and technical process adopted in the study would be effective and useful for urban and regional planners to evaluate the land use changes and fragmentation.

Keywords: Urban and Regional Planning, Land Cover Change, Land Fragmentation, Temporal and Spatial change

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LIST OF ABBREVIATIONS

Abbreviation	Description
ASCII	American Standard Code for Information Interchange
AREA_MN	Mean Area
ETM	Enhanced Thematic Mapper
ED	Edge Density
ENVI	Environment for Visualizing Images
ERDAS	Earth Resource Data Analysis System
GIS	Geographical Information System
GPS	Global Positioning System
Geo TIFF	Geographic Tagged Image File Format
Ha	Hectares
Km	Kilometres
LULC	Land use and land cover
LPI	Largest Patch Index
LFT	Landscape Fragmentation Tool
NDVI	Normalized Difference Vegetation Index
NP	Number of Patches
PD	Patch Density
PA	Producer Accuracy
STDP	Southern Transport Development Project
SHDI	Shannon's Diversity Index
V-LATE	Vector Based Landscape Analysis Tools
UA	User Accuracy