Cambodia GeoSpatial Day 2025

Royal University of Agriculture

Faculty of Land Management and Land Administration

TOPIC:

ASSESSMENT OF LAND USE AND LAND COVER CHANGE USING SENTINEL-2 IMAGES IN ROTONAK MONDOL DISTRICT, BATTAMBANG PROVINCE FROM 2016–2024.

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1.INTRODUCTION

1.1 Introduction to Research

❖ Land Use and Land Cover (LULC) change is increasing due to socio-economic development, agricultural expansion, and infrastructure growth, especially in developing countries like Cambodia.

❖ Remote sensing and GIS technologies, particularly Sentinel-2 satellite imagery, provide accurate, efficient, and cost-effective methods for monitoring landscape changes over time.

❖ Rotonak Mondol District has experienced visible land transformation in recent years, which requires scientific assessment to understand environmental and socio-economic impacts.

1.2 Research Problems

❖ Continuous conversion of natural land resources, especially forests and agricultural areas,

   into built-up and investment-driven land uses.

❖ Limited updated scientific data and monitoring regarding the spatial and temporal patterns of

   LULC change at the district level.

❖ Uncertain accuracy and performance comparison between different image classification

   methods, specifically Support Vector Machine (SVM) and Maximum Likelihood (ML).

1.3 Research Objectives

The study on this topic has two main objectives:

❖ To compare classification methods for land use and land cover using Sentinel-2 satellite imagery.

❖ To analyze the changes in land use and land cover in Rattanak Mondol district from 2016 to 2024.
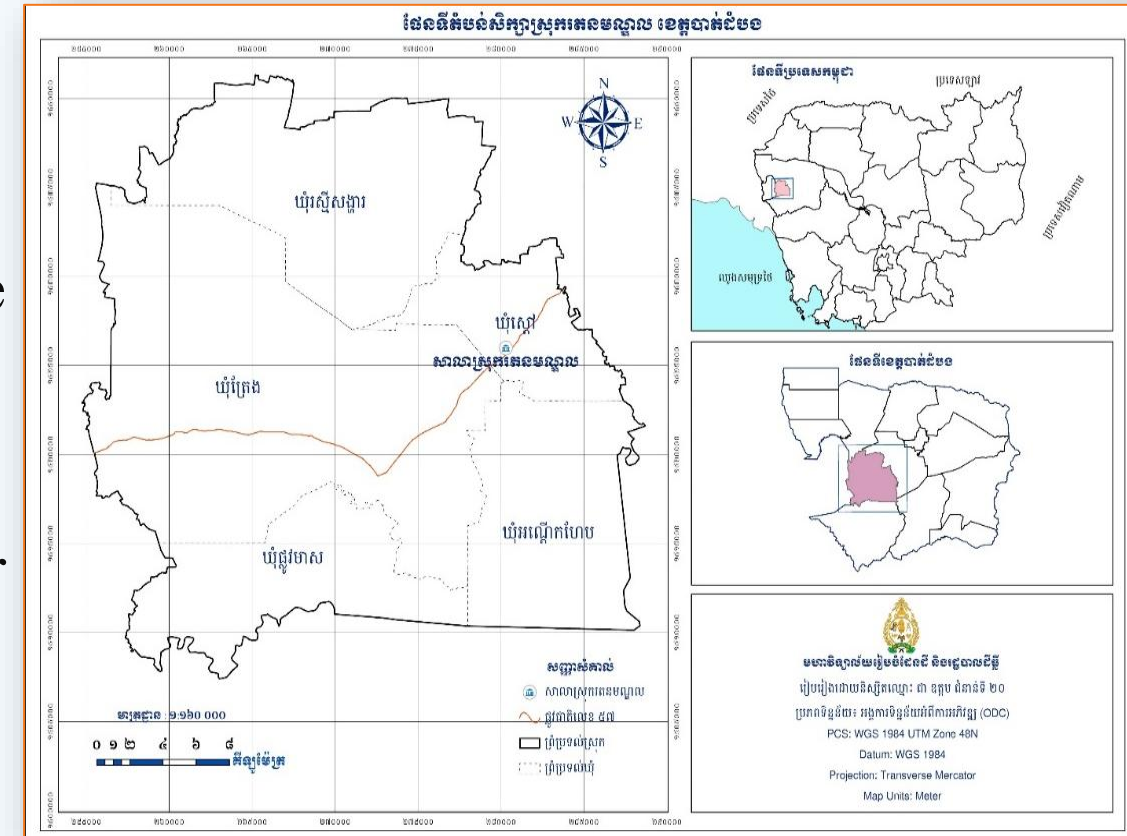
2. Research Methodology

2.1 Data Collection

❖ A. Primary Data

No	Data Type	Description	Samples
1	Built up	All settlement areas	70
2	Forest cover	Natural and disturbed forest	70
3	Water bodies	River ,Lakes, ponds, streams	70
4	Annual crops	Land used for growing crops that complete their life cycle in a single year	70
5	Permanent crops	Long-term plantations	70
6	Scrub land	Land covered mainly with low, small, shrubs, or bushes	70

❖ B- Secondary Data

No	Data	Source	Purpose
1	Sentinel-2 images: ❖ 29 April 2016 ❖ 30 April 2020 ❖ 20 April 2024	https://dataspace.copernicus.eu/	Produce land cover map
2	Administrative boundary of Ratanak Mondol District	Open Development Cambodia	To set the study size

2.2 Research Analysis

3.RESEARCH FINDING

Objective 1 : Compare classification methods for land use and land cover between SVM & ML
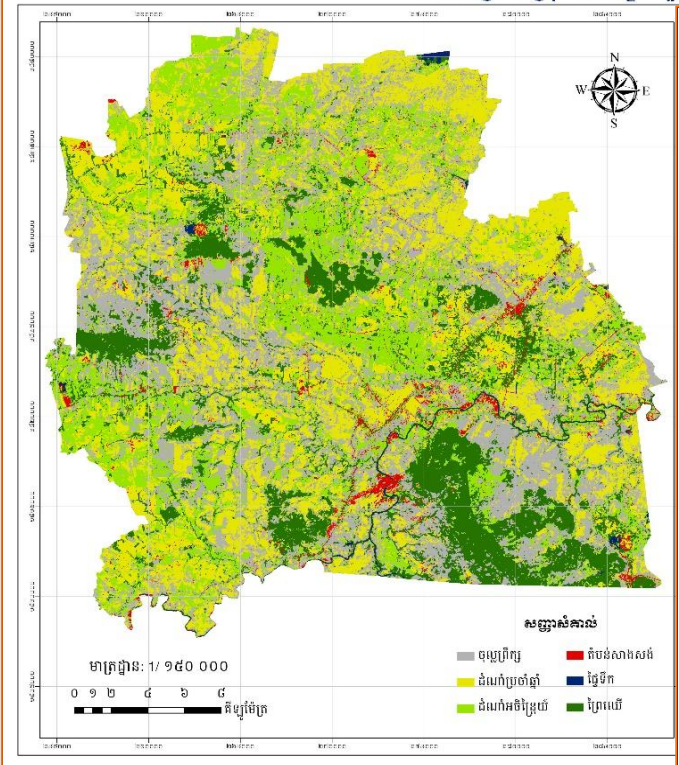
3.1 .Accuracy assessment results using the Support Vector Machine method in 2016, 2020, and 2024

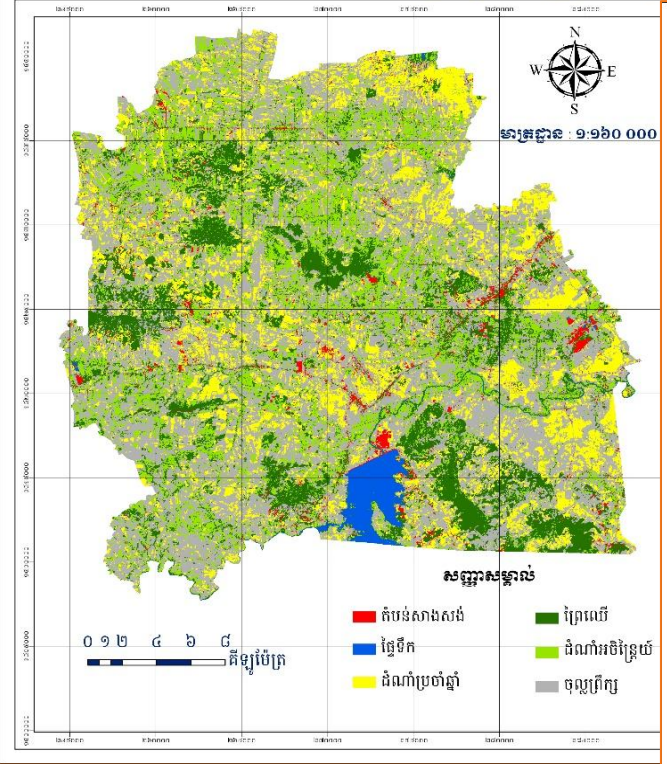| Land Use and Land Cover Map	Reference Data	Kappa coefficient	Overall Accuracy
Land Use and Land Cover Map 2016	Google Image 2016	0.82	85%
Land Use and Land Cover Map 2020	Google Image 2020	0.85	88%
Land Use and Land Cover Map 2024	Google Image 2024	0.84	87%

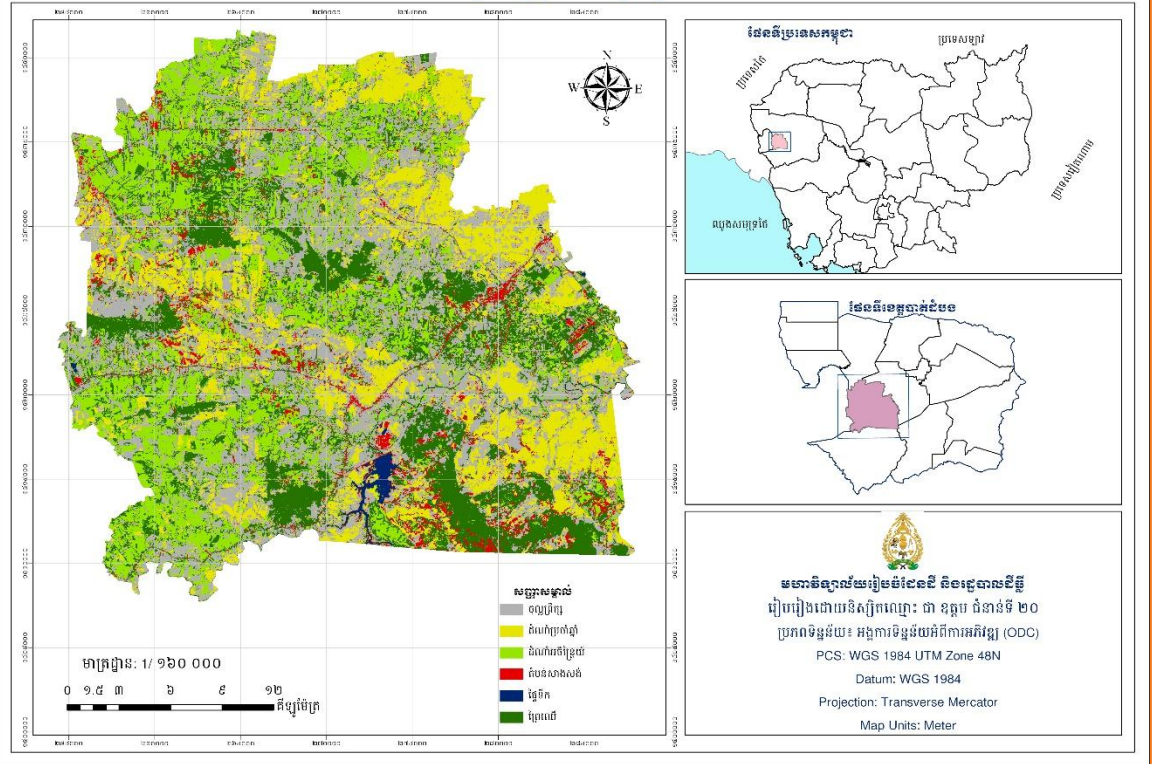# Land Use and Land Cover Maps for 2016, 2020, and 2024 using the SVM method

3.1 .Accuracy assessment results using the Maximum likelihood method in 2016, 2020, and 2024

Land Use and Land Cover Map	Reference Data	Kappa coefficient	Overall Accuracy
Land Use and Land Cover Map 2016	Google Image 2016	0.69	73%
Land Use and Land Cover Map 2020	Google Image 2020	0.67	72%
Land Use and Land Cover Map 2024	Google Image 2024	0.70	75%

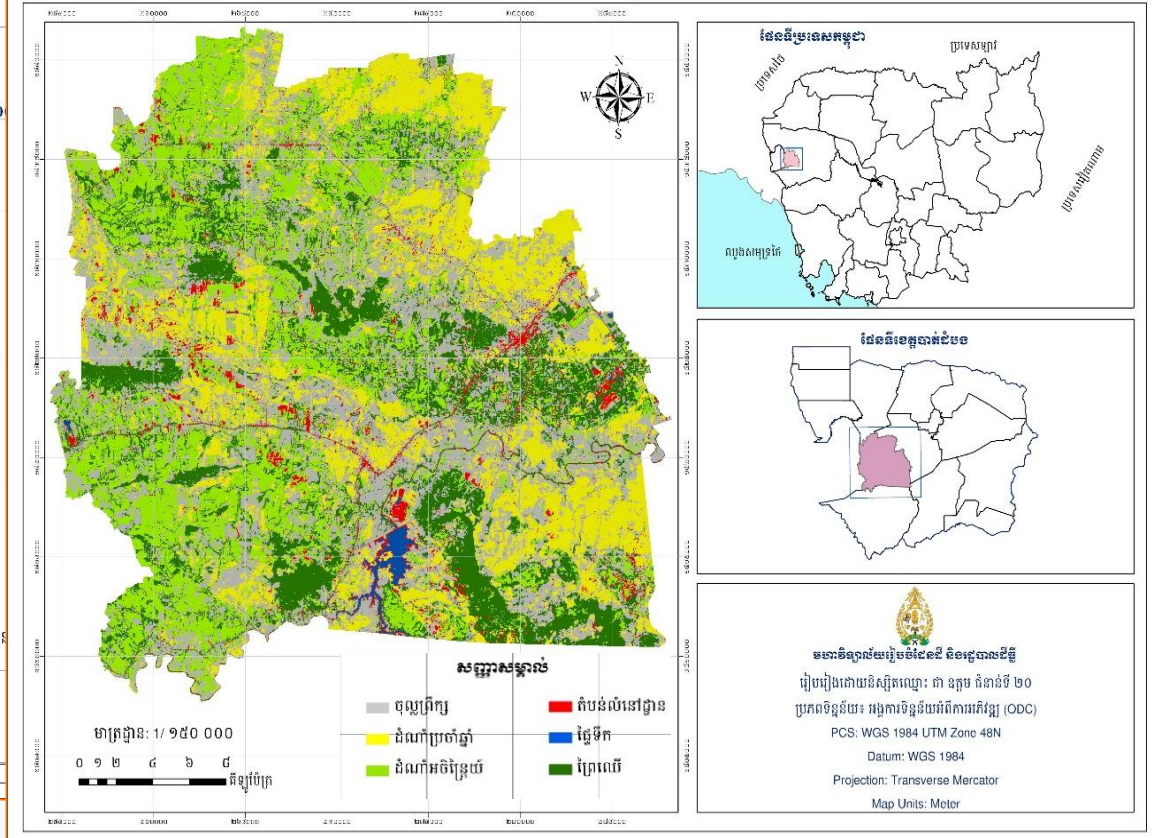# Land Use and Land Cover Maps for 2016, 2020, and 2024 using the ML method
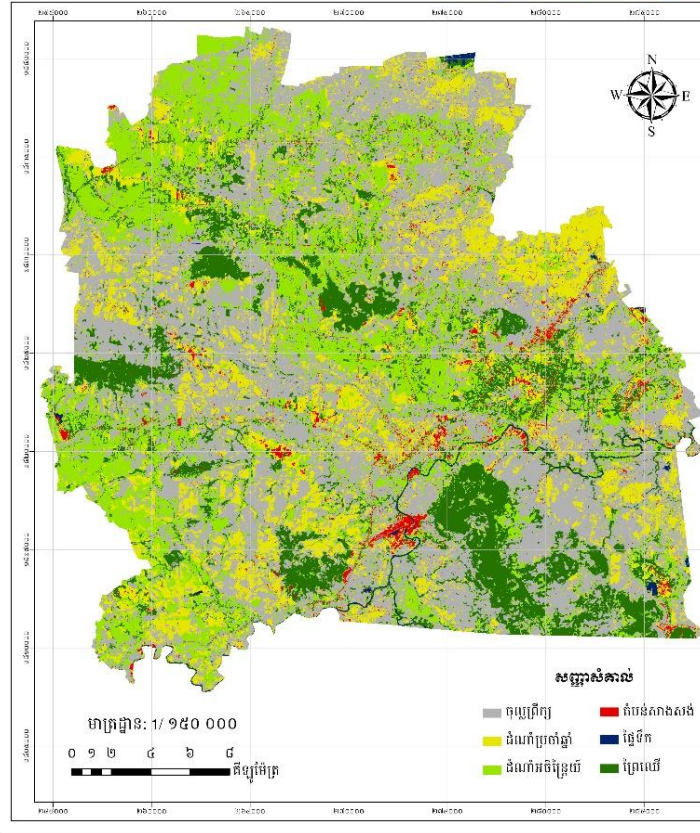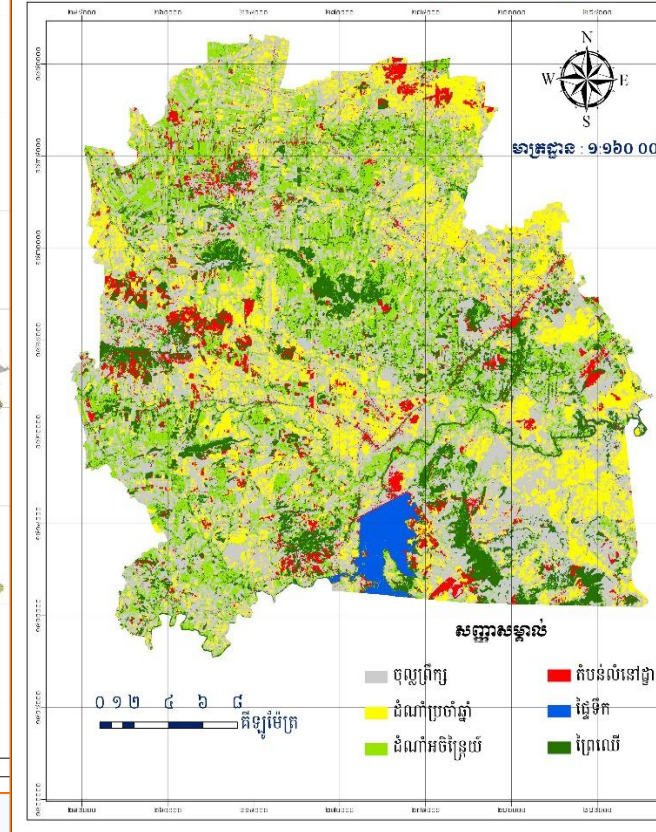
Objective 1 : Compare classification methods for land use and land cover between SVM & ML

❖ Accuracy values are considered **High** if greater than 85%,

Moderate if between 40% and 85%, and **Low** if less than 40%.

(Paul and Mr. Jansen)

❖ According to diagram of results using the SVM and ML methods

The method selected for analyzing land cover changes is the

Support Vector Machine (SVM) method.

Low	Moderate	High	Overall Accuracy
> 40%	40% - 85%	> 85%	

Land cover changes to different classes from 2016 to 2024

■ ML   ■ SVM
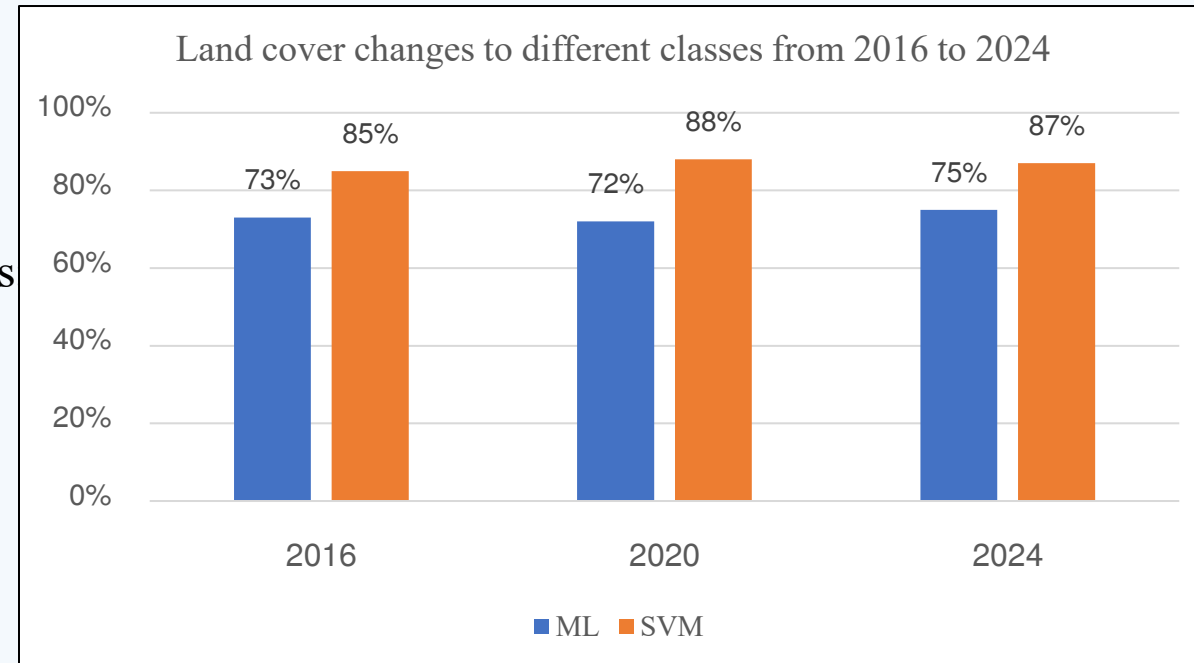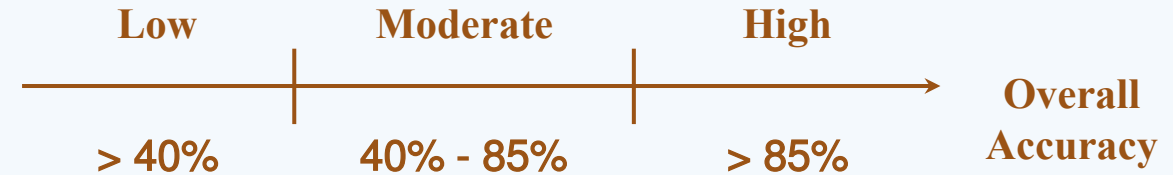
Objective 2: Analysis of Land Use and Land Cover Changes from 2016 to 2024

A. Results of Land Cover Changes from 2016 to 2024

Year	Type of Land Use (hectares)					
	Water	Annual crop	Forest	Scrub land	Built up	Perennial crop
2016	451	14393	16654	32827	1769	19783
2020	1458	15163	12677	34869	1443	14668
Change	1007	770	-3977	2042	-326	-5115
2024	750	15851	11057	25535	3589	17894
Change	298	1458	-5597	-7292	1819	-1889
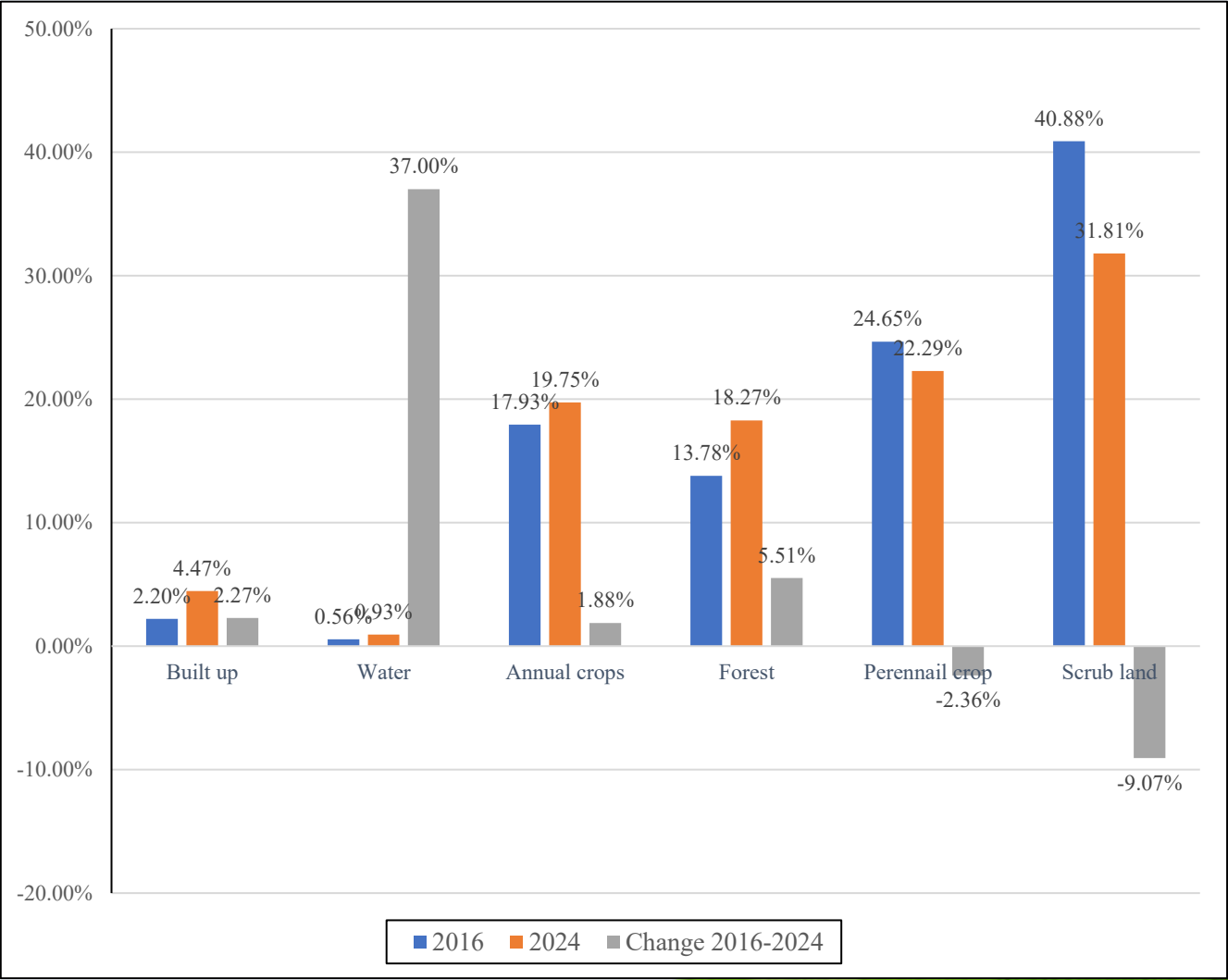
B. Land Cover Change Matrix in Rattanak Mondol District from 2016 to 2024

Class		2024						
		Scrub land	Annual crop	Perenial crop	Built up	Water	Forest	Total
2016	Scrub land	12637.81	8724.50	5347.49	1606.56	128.04	4373.18	32827.58
	Annual crop	3588.72	5605.04	3306.17	608.41	329.70	1249.76	14393.80
	Perennial crop	6378.89	1022.51	7754.10	576.46	289.21	3956.51	19783.68
	Built up	656.05	218.26	221.26	348.49	197.25	257.06	1769.37
	Water	73.56	3.96	114.53	20.08	168.88	68.19	451.20
	Forest	2194.73	273.19	1347.23	427.47	165.89	6745.70	16654.21
	Total	25534.76	15851.46	17894.78	3898.47	750.97	11057.40	80283.84

Land cover changes to different classes from 2016 to 2024
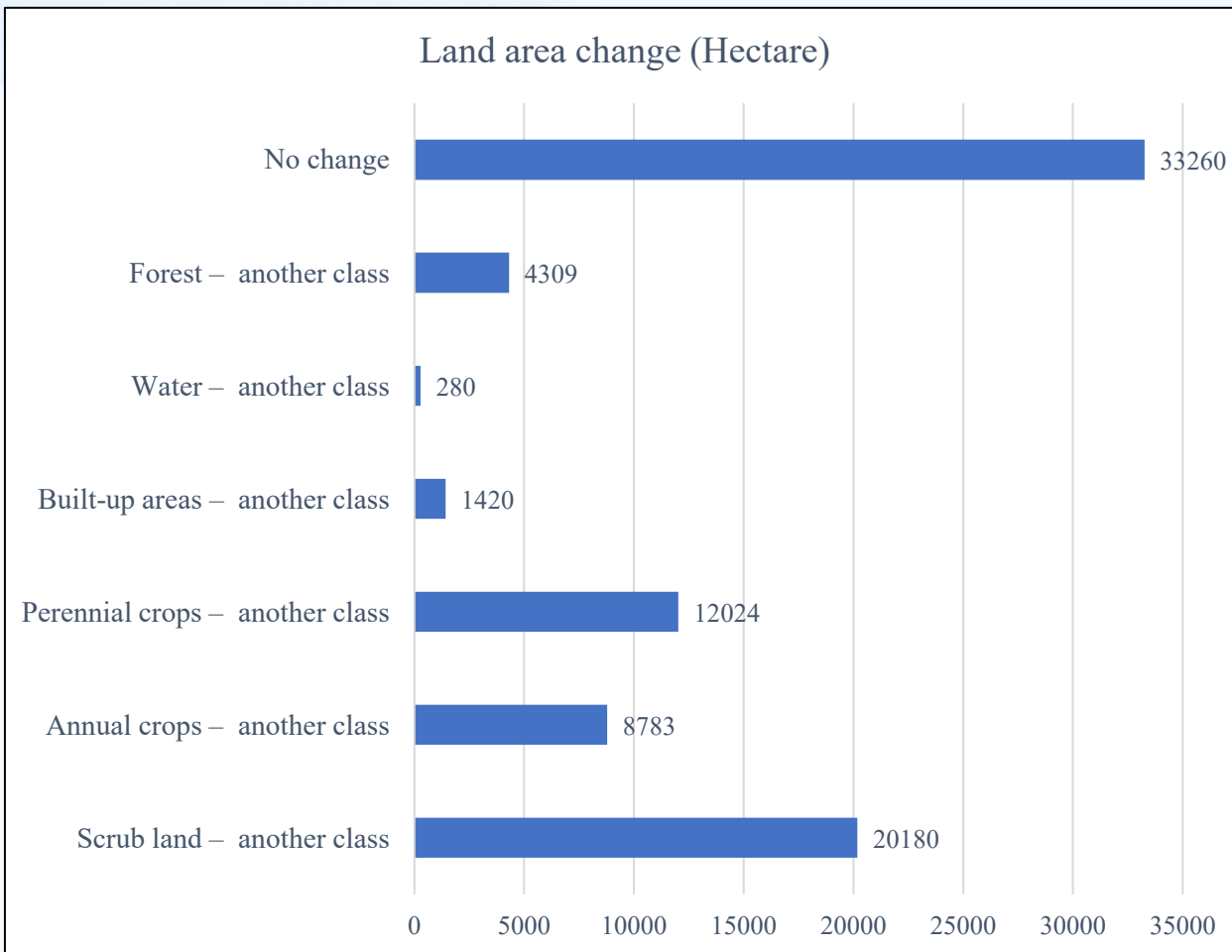
Land Use and Land Cover Change Map in Rotanak Mondol District, Battambang Province

Land area change (Hectare)

- No change: 33260
- Forest – another class: 4309
- Water – another class: 280
- Built-up areas – another class: 1420
- Perennial crops – another class: 12024
- Annual crops – another class: 8783
- Scrub land – another class: 20180

ផែនទីបម្រែបម្រួលគម្របដី ស្រុករតនមណ្ឌល ឆ្នាំ ២០១៦ ដល់ ២០២៤
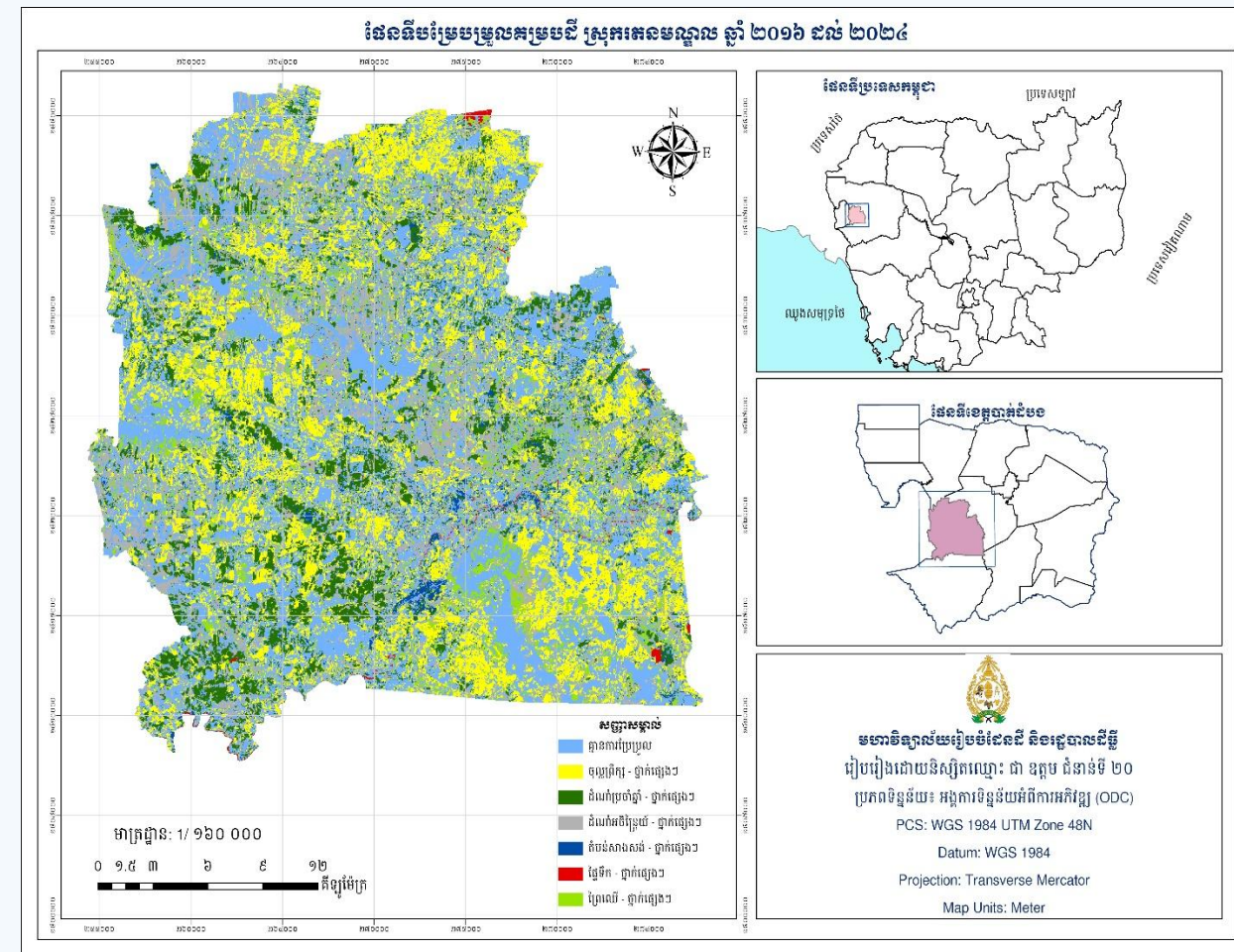
4.CONCLUSION AND RECOMMENDATION

4.1 Conclusion

❖ Land use and land cover changes in Rattanak Mondol District from 2016 to 2024 show notable changes in water bodies, forests, and perennial crops.

❖ The Supervised Classification method (Support Vector Machine) demonstrates higher accuracy than Maximum Likelihood (2016: 85% vs 73%, 2024: 87% vs 75%).

❖ It is difficult to distinguish between annual and perennial crops due to the low resolution (10m × 10m) of Sentinel-2 images.

❖ Land use and land cover changes in Rattanak Mondol District, Battambang Province, are likely influenced by three factors: population, economic conditions, and infrastructure.

4.2 Recommendation

❖ Try to obtain aerial photographs or other supporting data to validate the accuracy of land use and land cover maps for earlier years.

❖ If you plan to use the Supervised Image Classification method, you should have experience and knowledge in managing data, and a clear understanding of the geography and land use of the study area.

❖ If you serve as a map producer using Geographic Information Systems (GIS) and Remote Sensing techniques, you should apply the Support Vector Machine (SVM) method for map production, as it provides high precision and reliability.

❖ For land use in Rattanak Mondol District, attention should be given to protecting on private scrub land by converting it into fruit perennial crop land or annual crops land, while state scrub land should be restored into forests.

Thank you ! ! !