

Assessing and Analyzing the Spatial Distribution of Green Spaces in Paramaribo using GIS and Remote Sensing

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OUTLINE

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- Methods
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- Summary and conclusion

INTRODUCTION

“Urban Green Spaces can be defined as land that is partly or completely covered with grass, trees, shrubs, or other vegetation. Green spaces includes parks, community gardens, and cemeteries.”

(Environmental Protection Agency, 2017)

- **Green spaces play a major role in urban areas through their environmental, aesthetic, social and economic contributions.**

INTRODUCTION

PROBLEM DESCRIPTION AND RESEARCH OBJECTIVES

- Studies on green spaces around the world
- There is no quantifiable data on urban green spaces in Suriname
- Develop a baseline of the current extent of green spaces within the urban areas of Suriname and to analyze their spatial distribution

INTRODUCTION

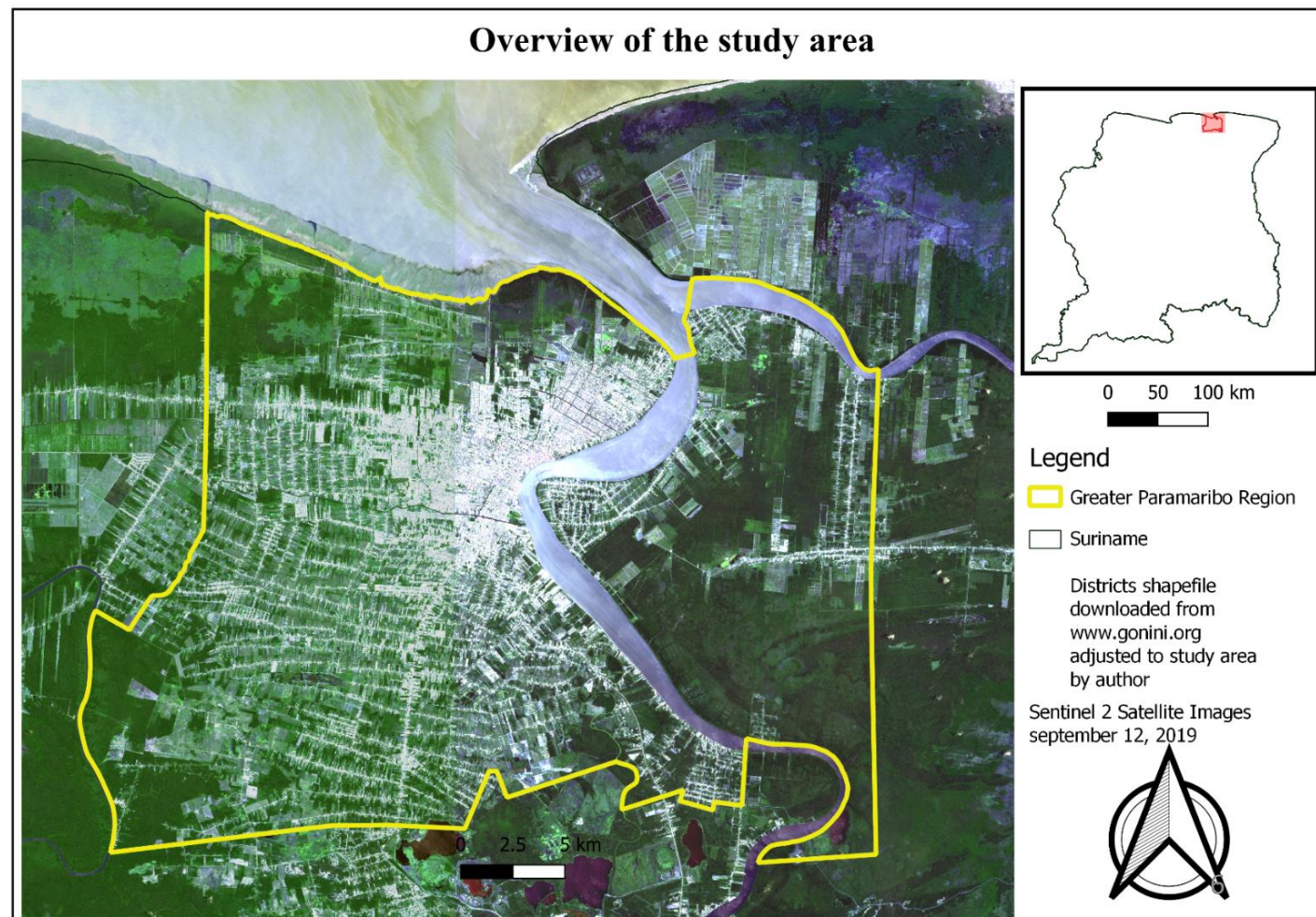
SUB-QUESTIONS

1. How are urban green spaces distributed in the greater Paramaribo Region in 2019?
2. What is the vegetation composition of the urban green spaces in the greater Paramaribo Region in 2019?

LITERATURE RESEARCH

STUDY AREA AND SATELLITE IMAGES

- The Greater Paramaribo Region
- Sentinel 2 Satellite Images dated September 12, 2019



LITERATURE RESEARCH

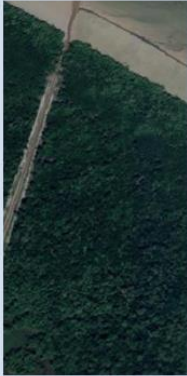

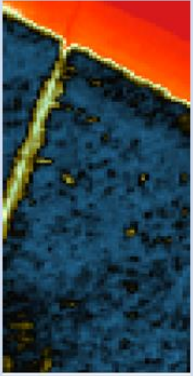


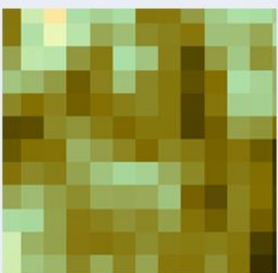
NDVI AND IMAGE CLASSIFIERS

- Normalized Differential Vegetation Index
- The random forest classifier
- The support vector machine classifier

MATERIALS AND METHODS

THE CLASSES

Class number	Class
1	Water
2	Built-up
3	Trees
4	Mangrove
5	Mix low vegetation
6	Infrastructure
7	Grass
8	Bare Soil

Google	Sentinel 2	NDVI
<p>Mangrove</p> 		
<p>Mix low vegetation</p> 		

MATERIALS AND METHODS

CLASSIFICATION

- Downloading 2 Sentinel 2 satellite Images
- Processing imagery

Pre-processing

Classifying

- Creating training data for the classifier. (Total of 229,775 pixels)
- Classifying the Images using the SVM tool in QGIS

- Ground truthing with field observations, high resolution Imagery and Google Earth Imagery. (Total of 173,800 pixels)
- Creating an error matrix and computing accuracies using QGIS

Validating

- Manual editing
- Final classification of

Finalizing

RESULTS AND DISCUSSION

THE NDVI MAP

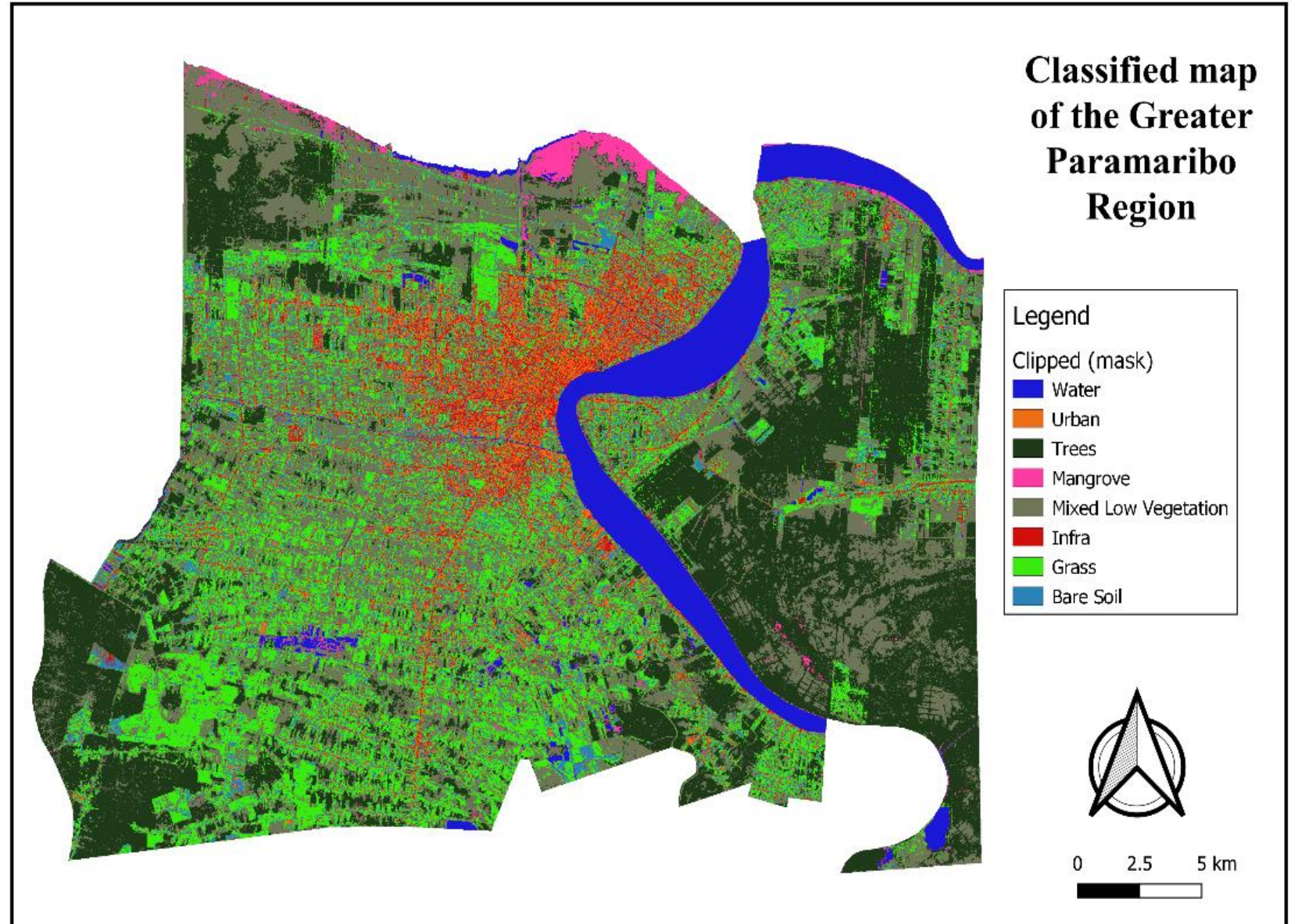


NDVI classes	NDVI values	Pixel count	Area (ha)	%
Water	< 0.1	620,000	6200	7
Shrubs and grass	0.2 - 0.3	340,000	3400	4
Trees	0.6 - 0.8	2,600,00	26000	30 10

RESULTS AND DISCUSSION

THE CLASSIFIED VEGETATION MAP

- Trees: 25 %
- Mix Low Vegetation: 28%
- Total UGS : 75%



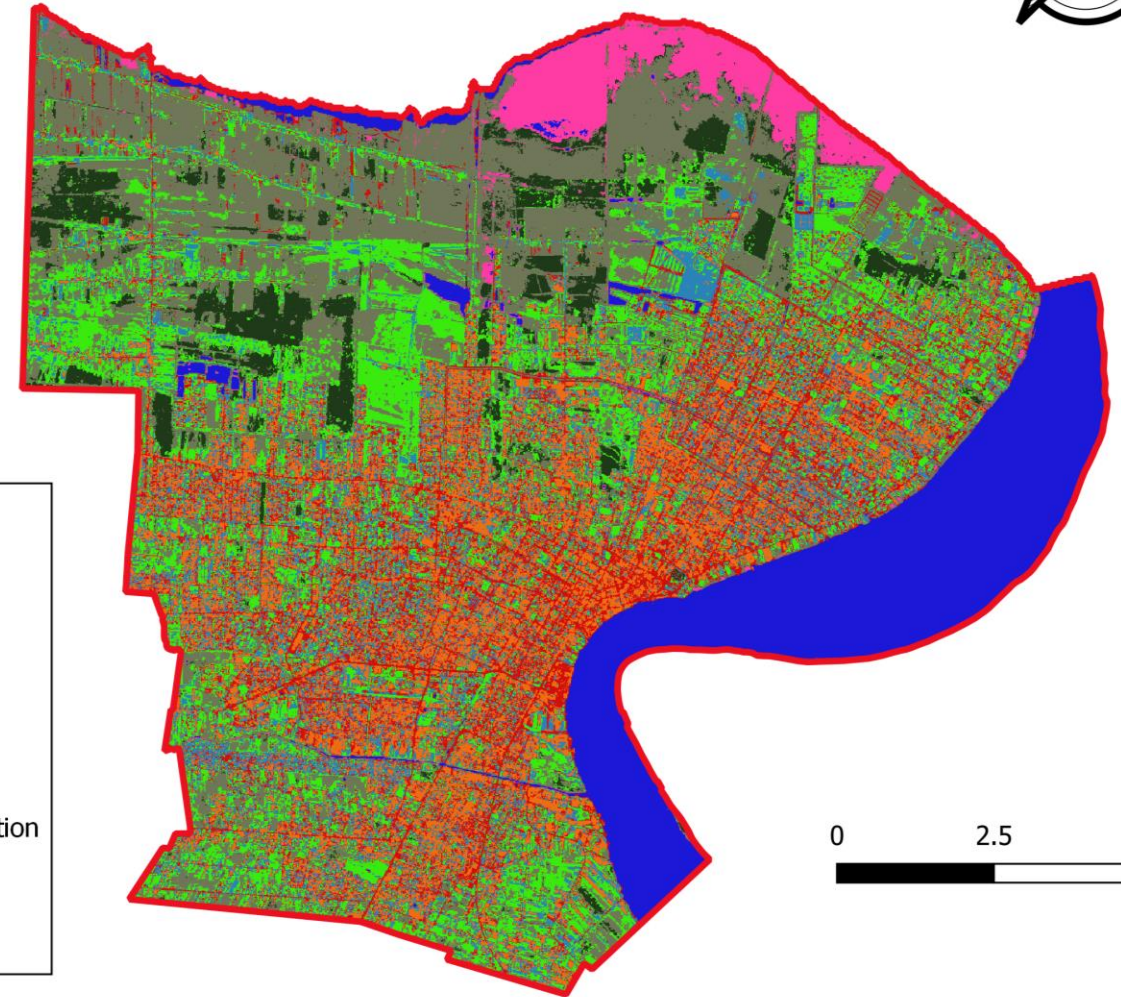
RESULTS AND DISCUSSION

THE CLASSIFIED VEGETATION MAP OF PARAMARIBO

- Trees: 1 %
- Mix Low Vegetation: 5%
- Total UGS relative to the GPR: 10%



Classified map of Paramaribo



RESULTS AND DISCUSSION

Class	Greater Paramaribo Region		Paramaribo	
	Area % of total region	Ha / 1000 inhabitants	Area % of total region	Ha / 1000 inhabitants
Water	6	14	3	10
Built up	5	10	3	9
Trees	25	57	1	4
Mangrove	1	3	1	3
Mix low vegetation	28	63	5	16
Infrastructure	6	12	3	10
Grass	21	46	3	12
Bare soil	8	17	2	8
Total	100		21	

RESULTS AND DISCUSSION

VALIDATION

Classes	Number of pixels for training data	Number of pixels for ground truthing	User's accuracy (%)	Producer's accuracy (%)
Water	185,526	142142	100.0	100.0
Built up	697	470	84.2	92.3
Trees	24,800	17827	99.3	76.1
Mangrove	9,306	6677	98.5	63.3
Mix Low Vegetation	4,313	3007	68.1	98.0
Infrastructure	257	213	85.8	98.9
Grass	2,269	1528	88.6	96.5
Bare Soil	2,607	1936	98.0	79.1

- The users accuracy is 90.31 %
- The producers accuracy is 88.02 %
- The overall accuracy of the 2019 vegetation map is 88.36 %

SUMMARY AND CONCLUSION

- 75% of the study area is classified as a vegetation type
- Trees: 25 % total out of which 1% is in Paramaribo
- Policy makers can replicate the method for monitoring trees keeping in mind the accuracies of the classes

ACKNOWLEDGEMENTS

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THANK YOU!