

TABLE OF CONTENTS

TITLE.....	i
APPROVAL.....	ii
STATEMENT	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS	v
LIST OF FIGURES	vii
LIST OF TABLES	ix
ABSTRACT.....	xi
ABSTRAK	xii
CHAPTER I INTRODUCTION	1
1.1 Background	1
1.2 Problem Formulation.....	2
1.3 Research Objective.....	4
1.4 Research Benefit.....	4
1.5 Research Authenticity	4
CHAPTER II LITERATURE REVIEW.....	11
2.1 Watershed Management	11
2.2 Urban and Rural Area.....	12
2.3 Heat Island.....	12
2.4 Urban Climate	15
2.5 Remote Sensing	18
2.5.1 Basics of Remote Sensing for Thermal System.....	19
2.5.2 Landsat Imagery.....	21
2.5.3 Temperature Extraction from Satellite Imagery	23
2.5.4 Indices	23
2.6 Theoretical Framework	25
2.7 Conceptual Framework	26
CHAPTER III METHODOLOGY	28
3.1 Equipment and Data	28

3.2 Research Location	29
3.3 Regression Analysis	29
3.4 Vegetation Indices Analysis	31
3.5 Temperature Extraction	33
3.6 Temperature Measurement	41
3.7 Results and Interpretation	41
CHAPTER IV RESULTS	46
4.1 Vegetation Indices	46
4.1.1 NDVI	46
4.1.2 NDBI	48
4.1.3 TDVI	49
4.1.4 Land Cover Characteristics	52
4.2 The Relationship between Vegetation Cover and Land Surface Temperature	57
4.3 The Relationship between Vegetation Cover and Near-Surface Air Temperature	75
4.4 Urban-Rural Temperature Difference	96
CHAPTER V CONCLUSION AND RECOMMENDATION	100
5.1 Conclusion	100
5.2 Recommendation	100
REFERENCES	103

LIST OF FIGURES

Figure 2. 1 Urban Canopy Layer and Urban Boundary Layer.....	13
Figure 2. 2 The Time and Horizontal Distance of Scale Atmospheric Phenomena	17
Figure 2. 3 Temperature in Urban Environment.	17
Figure 2. 4 Electromagnetic Wavelength use in remote sensing.....	19
Figure 2. 5 Planck’s Radiation Law in regard to spectral based on wavelength....	20
Figure 3. 1 Research Location	30
Figure 3. 2 Research Flowchart	44
Figure 3. 3 Temperature extraction	45
Figure 4. 1 Land Surface Temperature Map of Study Area March 2002.....	60
Figure 4. 2 Land Surface Temperature Map of Study Area August 2002.....	61
Figure 4. 3 Land Surface Temperature Map of Study Area March 2014.....	62
Figure 4. 4 Land Surface Temperature Map of Study Area August 2014.....	63
Figure 4. 5 Land Surface Temperature Map of Study Area May 2015.....	64
Figure 4. 6 Laser infrared thermometer used for measuring LST.....	65
Figure 4. 7 Measurement of LST in the field.....	65
Figure 4. 8 Thermometer used to measure near-surface air temperature.....	65
Figure 4. 9 Playground in the middle of residential in the urban area.....	65
Figure 4. 10 Sugar cane plantation in rural area	65
Figure 4. 11 Brick incineration site.....	65
Figure 4. 12 Prepared-field for paddy growing.....	65
Figure 4. 13 Change of Land Surface Temperature Correspond to The Change of Landcover from Rural type to Urban type.....	75
Figure 4. 14 The nearest location of air temperature condition at the day of image acquisition March 2002.....	78
Figure 4. 15 The nearest location of air temperature condition at the day of image acquisition August 2002.....	78
Figure 4. 16 The nearest location of air temperature condition at the day of image acquisition March 2014.....	78
Figure 4. 17 The nearest location of air temperature condition at the day of image acquisition August 2014.....	78
Figure 4. 18 Near-surface Air Temperature Map of Study Area March 2002.	81
Figure 4. 19 Near-surface Air Temperature Map of Study Area August 2002.....	82
Figure 4. 20 Near-surface Air Temperature Map of Study Area March 2014.	83
Figure 4. 21 Near-surface Air Temperature Map of Study Area August 2014.....	84
Figure 4. 22 Near-surface Air Temperature Map of Study Area May 2015.....	85
Figure 4. 23 Example of near-surface air temperature measurement	86
Figure 4. 24 Example of activity in the landuse in the field	86
Figure 4. 25 Example of high density of vegetation cover	86
Figure 4. 26 Change of Near-surface Air Temperature Correspond to The Change of Landcover from Rural type to Urban type	95

- Figure 4. 27 Relationship of Land Surface Temperature and Near-Surface Air temperature in the same respective landuse in urban environment.. 97
- Figure 4. 28 Relationship of Land Surface Temperature and Near-Surface Air temperature in the same respective landuse in rural environment... 98

LIST OF TABLES

Table 1. 1 Previous Research Related to Urban Heat Island and Landcover	6
Table 2. 1 Surface and Atmospheric Heat Island.....	14
Table 2. 2 Heat Island Assessment	14
Table 2. 3 Limiting Wind Speed Related to Heat Island in different Cities.....	16
Table 2. The Chatacteristics of 4 Landsat 8 Products	21
Table 2. 5 Landsat 8 Bands List.	22
Table 2. 6 Landsat 7 bands.	22
Table 3. 1 Estimated Surface Emissivity to the Corresponding NDVI.....	46
Table 3. 2 The objectives, methods and outcomes of the research.....	53
Table 4. 1 NDVI Value of Pixels of Study Area.....	47
Table 4. 2 NDVI Values of Sample Pixels for Urban Area	47
Table 4. 3 NDVI Values of Sample Pixels for Rural Area.	47
Table 4. 4 NDBI Value of Pixels of Study Area.	48
Table 4. 5 NDBI Values of Sample Pixels for Urban Area.	49
Table 4. 6 NDBI Values of Sample Pixels for Rural Area.	49
Table 4. 7 TDVI Value of Pixels of Study Area.	50
Table 4. 8 TDVI Values of Sample Pixels for Urban Area.	50
Table 4. 9 TDVI Values of Sample Pixels for Rural Area.....	50
Table 4. 10 The Value of Surface Albedo in Gajah Wong area.....	52
Table 4. 11 Respectives Vegetation Indices Value with Vegetation Cover in Urban Area	54
Table 4. 12 Respectives Vegetation Indices Value with Vegetation Cover in Rural Area	54
Table 4. 13 Relationship between Vegetation Index & Vegetation Cover (Fraction).....	56
Table 4. 14 Relationship Between Vegetation Index & Vegetation Cover.....	56
Table 4. 15 Basic Data Required to Calculate Land Surface Temperature	58
Table 4. 16 Land Surface Temperature vs Vegetation Indices for both Urban and Rural Environment based on March 2002 image.....	68
Table 4. 17 Land Surface Temperature vs Vegetation Indices for both Urban and Rural Environment based on August 2002 image.....	69
Table 4. 18 Land Surface Temperature vs Vegetation Indices for both Urban and Rural Environment based on March 2014 image.....	70
Table 4. 19 Land Surface Temperature vs Vegetation Indices for both Urban and Rural Environment based on August 2014 image.....	71
Table 4. 20 Land Surface Temperature vs Vegetation Indices for both Urban and Rural Environment based on May 2015 image.....	72
Table 4. 21 Land Surface Temperature vs Vegetation Indices for both Urban and Rural Environment based on Field Measurement.....	73
Table 4. 22 Statistics of Land Surface Temperature Difference Before and After	



Landuse Change	75
Table 4. 23 Parameter to Calculate Near-surface Air Temperature.....	76
Table 4. 24 ESUN calculation.....	76
Table 4. 25 Temperature Data at the Time of Satellite Image Acquisition	77
Table 4. 26 Field Measurement of Near-surface Air Temperature & Land Surface Temperature.....	78
Table 4. 27 Near-Surface Air Temperature vs Vegetation Indices for both Urban and Rural Environment based on March 2002 image.....	88
Table 4. 28 Near-Surface Air Temperature vs Vegetation Indices for both Urban and Rural Environment based on August 2002 image	89
Table 4. 29 Near-Surface Air Temperature vs Vegetation Indices for both Urban and Rural Environment based on March 2014 image.....	90
Table 4. 30 Near-Surface Air Temperature vs Vegetation Indices for both Urban and Rural Environment based on August 2014 image	91
Table 4. 31 Near-Surface Air Temperature vs Vegetation Indices for both Urban and Rural Environment based on May 2015 image	92
Table 4. 32 Near-Surface Air Temperature vs Vegetation Indices for both Urban and Rural Environment based on March 2015 Field Measurement...	94
Table 4. 33 Statistics of Near-surface Air Temperature Difference Before and After Landuse Change	95