

CONTENTS

An Analysis of the Evolution of Urban Climate in Kurunegala

A Dissertation

Submitted to the Department of Architecture of the
University of Moratuwa in Partial Fulfilment of the
Requirement for the Degree of
Master of Science

in

Architecture

M. J. S. Medamulla
Faculty of Architecture
University of Moratuwa
Sri Lanka

January 2003



CONTENTS

List of illustration	I
Acknowledgement	IV
Abstract	V
CHAPTER ONE - Introduction	1
1.1 Introduction	1
1.2 Scope of study	2
1.3 Justifications	3
1.4 Hypothesis	4
1.5 Brief methodology	5
CHAPTER TWO - Back Ground Study	6
2.1 Tropical Climate	6
2.1.1 Climate	6
2.1.2. Climatic Zones	9
2.1.3 Climate of Tropical Areas	10
2.2 Urban Climate	11
2.2.1. Urbanization	11
2.2.1.1 Development of Cities.	12
2.2.1.2. Pollutions of Cities.	13
2.2.2.The Climate of Cities.	16

2.2.3 Factors Effecting To Urban Climate.	18
2.2.3.1. Shadow Umbrellas.	18
2.2.3.2. Urban Heat Island Effects.	18
2.2.3.3 Canyon Effect	19
2.2.3.4. Urban Vegetation	20
2.4 Urban Design and Climate	20
2.4.1 Factors affecting To Climate Design	20
2.4.2. Effect of Climatic Change.	21
2.4.3 Urban Design Goals.	22
2.4.4 Influence on Build Form.	24
CHAPTER THREE - Historical Back Ground	
of Kurunegala	27
3.1. Historical Back Ground of Kurunegala.	27
3.1.1. Historical Back Ground of Kurunegala District.	27
3.1.2. Brief History of Kurunegala Period.	30
3.2. History of City Development at Kurunegala.	31
3.2.1 Early City Planning.	31
3.2.2 Factors affect Develop as a City	32
3.2.3. City Development during Colonial Period.	34
3.2.4. City Development during Postcolonial Period.	37
3.3. Urban Fabric Of Kurunegala City.	39
3.3.1 Climatic Condition.	39

3.3.2 Geographical Condition.	39
3.3.3. General Character of the City.	40
3.3.3.1 Lake	40
3.3.3.2. Rock	41
3.3.3.3. City	41
CHAPTER FOUR — Methodologies	43
4.1. Independent variables.	43
4.1.1. Land use maps.	43
4.1.2. CAD 3D models	43
4.1.3. Façade study	43
4.1.4. Photographic study	44
4.2. Dependent variables	44
4.2.1. 30-year climatic data	44
4.2.2. City traverse	46
4.3 Analysis techniques	47
4.3.1. Thermal comforts. Vs. section through city	48
4.3.2. Thermal comforts. Vs. land cover	48
4.3.3. Thermal comforts. Vs. 3D form	49

CHAPTER FIVE - Data and Analysis **50**

5.1. Data and Analysis 50

CHAPTER SIX – Conclusions **75**

6.1. Strategies 77

6.2. Limitations 80

6.3. Areas for Future Study 81

References **83**

Appendix **87**

➤ Temperature Scales 87

➤ Temperature Precipitation Scales 88

➤ Tables of 30-Year Climatic Data 89

➤ Data Tables of City Traverse 90

➤ Temperature and RH Variation during 24 Hours - Charts (12.12.2002). 96

LIST OF ILLUSTRATIONS

1. Map Of World's Climate	8
2. Temperature Difference, Between Urban And Rural.....	19
3. Design Methods For, Various Climatic Zones.....	26
4. Map Of Tolamy.....	27
5. "Satkoralaya".....	29
6. The Map Of Road Lay Out Of Kurunegala, Which Shows The Connection With Other Deviations In Sri Lanka.....	36
7. The Map Of Kurunegala Town Limit.....	38
8. Rainfall Of Sri Lanka.....	39
9. View From "Weu Gala".....	40
10. View Of The "Maraluwawa Kanda".....	40
11. View Of The "Athugala" And "Ibbagala" From "Weu Gala".....	40
12. View Of The "Weu Gala".....	40
13. "Puttalam" Road Directly Focused To The "Athugala.....	41
14. "Athugala" and "Ibbagala" Touching each other.....	41
15. View of The Bus Stand.....	41
16. View of The Bo Tree.....	41
17. Clock Tower Junction.....	42
18. "Parakumba" Street.....	42
19. Increasing Of The Building Heights.....	44
20. Method, How Could Measured the Land Cover.....	48

20. Method, How Could Measured the Land Cover.....	48
21. Travel Route.....	49
22. Land Use Map.....	51
23. Clock Tower Junction.....	52
24. Puttalam Handiya.....	52
25. City Center.....	52
26. Façade Study – Puttalam - Kandy Road.....	53
27. Façade Study – Negambo - Dambulla Road.....	53
28. Photographic Study – Athugala.....	54
29. Photographic Study – City.....	56
30. THI Vales-Day Time (1971-2000).....	60
31. Temperature-Day Time (1971-2000).....	60
32. THI-Night Time (1971-2000).....	61
33. Temperature-Night Time (1971-2000).....	61
34. THI-Day Time (March).....	62
35. Thi-Night Time (March).....	62
36. Temperature - Day And Night (March).....	62
37. THI-Day Time (December).....	63
38. THI-Night Time (December).....	63
39. Temperature - Night And Night (December).....	64
40. Temperature-“Athugala”.....	65
41. Travel Route Of “Athugala”.....	65
43. Temperature – Day Time (City Travers).....	66

44. Travel Route – Daytime.....	66
45. Temperature – Night Time (City Traverse).....	68
46. Travel Route – Night Time (City Traverse).....	68
47. THI – “Athugala” Day Time (City Travers).....	69a
48. THI - Day Time (City Travers).....	69b
49. THI - Night Time (City Traverse).....	69c
50. Reference Station Data - Night Time.....	70
51. Reference Station Data - Day Time.....	70
52. 3Dmesh Day Time.....	71
53. 3Dmesh Night Time.....	72
54. Land Cover Measured Points.....	74

Acknowledgement

I wish to acknowledge my indebtedness and gratitude to the following persons that assisted me during the endeavor. My sincere thank to the following members of the staff of the Department of Architecture University of Moratuwa.

Professor Nimal De Silva, head of the Department of Architecture, for his advice to select the dissertation topic and advice given at the initial stages of the study.

To Dr. Rohinton Emmanuel and senior lecture, for the constructive criticism, inspiring discussion, encouraging words and above all for his faith in my effort.

To senior lecture, Archt.Vidura Sri Nammuni and lecture Archt.Prasanna Kulathilaka of the Department of Architecture, I present my grateful thanks for their precious contribution in clarifying my dissertation in indistinct situations.

My specials thank to officers of Meteorological Department of Colombo and Kurunegala for providing me with the climatic data.

To my friends, for helping, encouraging and supporting me, in numerous, countless ways.

I wish to take this opportunity to thank dearest aunty Sisira and uncle Tissa for their valuable time and priceless knowledge in completing this document.

Finally my dearest parent for continuous guidance and blessings extended through out the time.

Abstract

In this fast moving world the term energy is commonly the topic people talk about. As technology reached almost to its acme, it provides many amenities and facilities to the urban dwellers. People from the rural areas migrate to the city in search of better living conditions, and as such the building density of the city increases to cope up with the increasing population. Hence living in a city is difficult due to climatic and economic fluctuation. To rectify this uncomfortable situation, artificial alterations are sought after, such as air conditioning fans and many similar items consuming electricity. Even though it is expensive living in a city if climate conditions are salubrious it will gain mental satisfaction. This will effect the population both physically and mentally. Giving design strategies to cover the entire city will tend to ease this problem, and make living comfortable as a whole.

CHAPTER ONE