

LB/D004/104/06

400

**AN EXAMINATION OF THE RELATIONSHIP BETWEEN
CLIMATE, CULTURE AND BUILT FORM WITH SPECIAL
REFERENCE TO
HOT-HUMID CLIMATE**

**LIBRARY
UNIVERSITY OF MORATUWA, SRI LANKA
MORATUWA**

A Dissertation presented to the
University of Moratuwa
For the Final Examination in M.Sc.
Architecture
March 2005

72⁰⁵
72(043)

University of Moratuwa



85473

NAVARATHNE N.M.R.K.

2005

85473



85473

CONTENTS

	Pg. no.
ACKNOWLEDGEMENT	i
LIST OF ILLUSTRATION	ii
ABSTRACT	iii
INTRODUCTION	01
CHAPTER ONE: APPROACH TO CLIMATIC DESIGN THE TROPICAL CLIMATE AND ITS RELATIONSHIP TO ARCHITECTURE	
1.1 INTRODUCTION TO THE CLIMATE AND DIFFERENT CLIMATIC TYPES	05
1.1.1 SPECIFIC ELEMENTS OF CLIMATE	05
1.1.2 GLOBAL CLIMATIC ZONES	09
1.2 CHARACTERISTIC FEATURES OF THE CLIMATE OF SRI LANK	10
1.2.1 WARM HUMID REGIONS WITH LOW RAIN FALL	11
1.2.2 WARM HUMID REGIONS WITH HEAVY RAIN FALL	11
1.2.3 COOL MOUNTAINEOUS REGIONS WITH HEAVY RAINFALL	12
1.3 CLIMATIC APPROACH TO ARCHITECTURE	13
1.3.1 INTENTION OF ARCHITECTURE	13
1.3.2 SHELTER AND CLIMATE	14
1.3.3 RECOMMENDATIONS FOR DESIGNING IN THE SELECTED REGION	18
1.3.3.1 SITE LOCATION	18
1.3.3.2 ORIENTATION	19
1.3.3.3 FORM OF BUILDING	20
1.3.3.4 OPENINGS AND SHADING DEVICES	21
1.3.4 PRINCIPLE FOR COMFORT IN THE WARM HUMID CLIMATE	21
1.3.5 CLIMATE MODIFICATION STRATEGIES	21
1.3.5.1 VENTILATION STRATEGIES (PASSIVE)	23
1.3.5.2 SKY LUMINANCE AND SHADING STRATEGIES	25
1.3.5.3 INSULATION STRATEGIES	28



1.4 COMFORT AS THE NEED FOR CLIMATE RESPONSIVE STRATEGIES IN ARCHITECTURE	29
1.4.1 ATTRIBUTES OF COMFORT	31
1.4.1.1 PHYSICAL COMFORT	31
1.4.1.1.1 THERMAL COMFORT	31
1.4.1.1.2 VISUAL COMFORT	32
1.4.1.2 PSYCHOLOGICAL COMFORT	32
1.5 CLIMATE AS FORM GENERATOR IN ARCHITECTURE	33
1.6 CLIMATE RESPONSIVE DESIGN	36
CHAPTER TWO: THE CULTURAL REFLECTION IN ARCHITECTURE	
2.1 CULTURE	39
2.1.1 INTRODUCTION TO THE CULTURE	39
2.2 STUDY OF SINGHALESE CULTURE	40
2.2.1 HISTORICAL BACKGROUND OF SINGHALESE CULTURE	40
2.2.1.1 CAST SYSTEM	42
2.2.1.2 MAN'S SOCIAL STATUS	43
2.2.1.3 KINSHIP	43
2.2.1.4 FAMILY STRUCTURE	44
2.2.1.5 THE WAY OF THE GAINING LIVELIHOOD	44
2.2.1.6 RELIGION	45
2.2.1.7 FUNCTION AND CEREMONIES	46
2.2.1.8 MYTHS, BELIEFS AND SUPERSTITIONS	46
2.2.3 EXPRESSION OF SINGHALESE CULTURE	47
2.3 SINGHALESE CULTURE AND RESIDENTIAL BUILDINGS	49
2.3.1 INTRODUCTION OF THE BUILDING TYPES IN EARLY SINGHALESE SOCIETY	49
2.3.1.1 FEUDAL LANDOWNERS HOUSE OR "WALAWWA"	49
2.3.1.2 PEASANT'S HOUSE	49
2.3.1.3 POOR PEASANT'S HOUSE	49
2.3.2 GENERAL CHARACTERISTICS OF THE BUILDINGS	49
2.3.2.1 LOCATION	49
2.3.2.2 3D COMPOSITION	50

2.3.2.3 PLAN FORM	50
2.3.2.4 STRUCTURE	52
2.3.2.5 FINISHES	52
2.3.3 THE COMMON CHARACTERISTIC FEATURES	52
2.3.4 THE SYMMETRICAL ARRANGEMENT OF ACTIVITY AREA	53
2.3.5 THE AXIAL PLANNING OF THE SPACE	53
2.3.6 THE REGULARITY OF THE GRID USED	54
2.3.7 THE INTERNAL COURTYARD	54
2.3.8 IDENTIFICATION AS A REFLECTION OF CULTURE	58
2.4 DRVIDAN CULTURE AND RESIDENTIAL BUILDINGS	59
2.4.1 SOCIO CULTURAL BACKGROUND	59
2.4.2 DRVIDAN CULTURE AND RESIDENTIAL BUILDINGS	61
2.5 CLIMATE RESPONSES SEEN IN NATURE AND IN DIFFERENT CULTURES	66
 CHAPTER THREE: AN EXAMINATION OF THE RELATIONSHIP BETWEEN CLIMATE, CULTURE AND BUILT FORM	
3.0 CASE STUDIES	77
3.1 CASE STUDY 01	77
3.1.1 TRADITIONAL PEASANT HOUSES AND THEIR RELATIONSHIP TO CLIMATE AND CULTURE	77
3.1.2 KANDYAN PERIOD HOUSES	79
3.1.3 CLIMATIC ANALYSIS	80
3.1.4 CULTURAL ANALYSIS	82
3.2 CASE STUDY 02	83
3.2.1 TRADITIONAL TAMIL HOUSES AND THEIR RELATIONSHIP TO CLIMATE AND CULTURE TYPES OF HOUSES	83
3.2.1.1 TRADITIONAL HOUSES	83
3.2.1.2 TRADITIONAL VILLAGE HOUSE	83
3.2.1.3 SINGLE CELL UNIT	83
3.2.1.4 THREE COMPARTMENT UNIT	83
3.2.2 TRADITIONAL COURTYARD HOUSES	88
3.2.3 COLONIAL INFLUENCED HOUSES	88



3.2.4 A COURTYARD HOUSE, THE MOST CULTURAL-INTER GRATED FORM	88
CONCLUSION	93
BIBLIOGRAPHY	



ACKNOWLEDGEMENT

I offer my sincere thanks to Dr. Harsh Moonasingha and Dr. Upendra Rajapaksh, Coordinator, Post-Graduate Dissertation, For their untiring advise and guidance.

My appreciation is expressed to Miss. Marine Samarathunga, Ayeshani De Silva and Roshini Weekramanayake for their valuable assistance.

I expressed my thank to Chandika, Rasika, Asanga, Rasika, Lakkana for their supporting.

Finally I wish to thank my family, Dilupa Akka and Thushara Aiyya and finally Buddhika Aiya for their encouragement and helping.



LIST OF ILLUSTRATION

Pg. no.

- Fig. 01: Water bodies provide the water vapour to the air
Fig. 02: Wind; change the Topography of given region
Fig. 03: Global climatic zones
Fig. 04: Main climatic regions of Sri Lanka
Fig. 05: Climatic data collected for wet zone
Fig. 06: Climatic data collected for dry zone
Fig. 07: Climatic data collected for hilly zone
Fig. 08: Active and passive climatic data
Fig. 09: Arabian houses with small openings to reduce heat gain during day and heat loss at night
Fig. 10: Eskimo Igloo
Fig. 11: Different cultures express through the different symbols; Sinhalese, Dravidian and Islamic Cultural symbols
Fig. 12: Agricultural base Sinhalese culture
Fig. 13: The Communal feeling, significant character of Sinhalese society
Fig. 14: Self-sufficient Sinhalese society Sri Lanka
Fig. 15: Agricultural ceremony
Fig. 16: Simple life style with harmony with nature
Fig. 17: Low- rise simple buildings with a high plinth
Fig. 18: Residential buildings; Plan forms
Fig. 19: traditional houses of Jaffna, are high parapet fence of palmyrah leaves
Fig. 20: sacred oil lamp in the shrine room, which is lit throughout the day and night also produce] smoke
Fig. 21: All the family activities are carried out in the center courtyard
Fig. 22: Lotus are blooming with first morning sun shine
Fig. 23: Big animals like buffalos, elephants, and hippopotamus respond to the heat of the sun by using the insulation properties of mud and water in the ambient environment
Fig. 25: Sun controls the entire planet
Fig. 25: Poya day
Fig. 26: Hindus celebrate Thai Pongal, in January to honor sun deity
Fig. 27 Egyptian cotton clothing, applied black eye liner to protect eyes from excessive heat at night
Fig. 28 People in barbarian tribes colored their body with mud to protect their bodies from excessive heat
Fig. 28 Indians/Sri Lankans, sarees and sarongs to keep the body cool

- Fig.29 Boats with simple sails.
- Fig.30: The verandah of a traditional rural house
- Fig.31: A simple rural dwelling
- Fig.31: A slight large rural dwelling
- Fig.32: The Kandyan courtyard
- Fig.33: Plan of a courtyard house
- Fig.34: Section through the Courtyard house
- Fig. 32: Traditional village house of Jaffna
- Fig.33: Typical layout of the single unit house
- Fig. 34: A round house with Thinnai and Nadai at pointpedro
- Fig. 35: Round house at Chavkracahchari
- Fig. 36: general composition three compartment house
at Alaveddu
- Fig.37: Plan of the three units of the traditional house
- Fig. 38: A Cortyard house with two courtyards at Vannarponnai
- Fig. 39: A courtyad house at Poinetpdro and Vannarponna



ABSTRACT

It is the need for protection from climate that compelled man to build shelter. Since then, his endless thirst for comfort evolved this basic skeleton into new forms thus creating architecture. Human comfort is identified as physical comfort and psychological comfort. These two are closely linked with each other. Physical comfort facilitates psychological comfort. Therefore achieving physical comfort has a close relationship with climatic response of a built environment, which is manifested by climate responsive design strategies. Strategy is the art of planning the way to achieve something or to be successful in a particular field. The term strategy is used to mean a list of actions taken by a designer, in order to transform an initial brief into a final design. In any field, not only in architecture, people have advocated strategic methods to achieve best results therefore climate responsive design strategies in architecture are list of methods or combination of design decisions that one can intend to use to achieve best results in the field or architecture, in a specific climatic condition. The unique climatic conditions and comfort needs, along with other socio-cultural factors create unique forms and unique places throughout the world.

"Climate is clearly one of the prime factors in culture, and therefore built form. It is the mainspring for all the sensual qualities that add up to a vital tropical architecture."

Tan Hock Beng (1994: 13)

Climate is the most important factor that brings unique characteristics to different regions of the planet earth. For example Alaska is different from Africa due to its unique climate. Therefore the culture is also should be unique in those unique places, which generate unique built form. Climate responsive design strategies should contribute immensely to enhance the culture of those places. Therefore

the essay would be an attempt to combine the qualitative aspect (Uniqueness of place) along with the quantitative aspects (climate) of architecture.

↓ Scope & limitations
indicates a quantitative approach

