

71601 2/7/97

GREEN ARCHITECTURE : A STUDY OF THE CONCEPT AND ITS APPLICABILITY FOR SRI LANKA

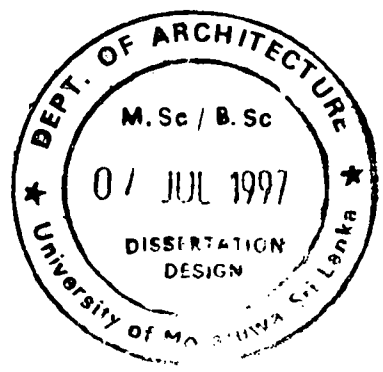
ප්‍රච්ඡාදකයා
මොරටුව විශ්ව විද්‍යාලය, ශ්‍රී ලංකාව
මොරටුව



University of Moratuwa
Electronic Theses & Dissertations
www.lib.mrt.ac.lk

A DISSERTATION SUBMITTED TO THE
UNIVERSITY OF MORATUWA SRI LANKA
FOR THE
FINAL EXAMINATION IN
M.Sc. (ARCHITECTURE)
JUNE, 1997

71601
72 "97"
71601



S.A. SOMATHILAKA
M.Sc. II (1997)
DEPT. OF ARCHITECTURE
UNIVERSITY OF MORATUWA, SRI LANKA

71601

714

ABSTRACT

Man's activities on the earth has existed affecting on environmental balance since hundreds of years. It is increasing with the time and architecture also act as a major contributor on environmental degradation in terms of buildings. For the purpose of finding solutions for such environmental problems, the green concept of architecture has emerged. Actually it is not a new concept, what is new is its re emergence. This architectural concept cannot be defined in isolation. Always it is related to sustainable, eco-sensitive and ecologic conceptions. This study aimed to examine the green concept and its applicability for Sri Lankan architectural practices. Initially the concept is identified by fragmenting it into few principles which it is based on. These principles are called green architectural principles in the literature. For the convenience of its applicability for Sri Lankan architectural practices the study arranged the into a theoretical framework. The application of this framework into Sri Lankan traditional and contemporary architectural practices reveals that Sri Lankan traditional architecture was an eco-sensitive architectural practice and contemporary practice is abandoning what the traditional architecture had followed in the past. To avoid architectural trends which create environmentally unfriendly architecture and to build the good responsive architectural practice for future. The application of green ideas in the building process are identified. A work plan has formulated for the use as a guide for designers and requirements that should be fulfilled during the design to completion stage has also prepared.

CONTENTS

	Page
ACKNOWLEDGMENT	I
LIST OF ILLUSTRATIONS	II
INTRODUCTION	O 1
CHAPTER 1	
1. THE CONCEPT OF GREEN ARCHITECTURE	O 2
1.1. GREEN ARCHITECTURE	
A DEFINITION	O 3
1.1.1 SUSTAINABLE DEVELOPMENT	O 5
1.1.2. SUSTAINABLE ARCHITECTURE/DESIGN	O 6
1.1.3. ECO-SENSITIVE ARCHITECTURE	O 7
1.1.4. CONCEPTUAL FRAMEWORK FOR GREEN ARCHITECTURE	O 8
1.2. GREEN MOVEMENT IN ARCHITECTURE AS A SUSTAINABLE SOLUTION FOR FUTURE	10
1.2.1. PRINCIPLE 1	
CONSERVATION OF ENERGY	10
(1) SITE PLANING	11
(2) MATERIALS SELECTION	11
(3) USE OF NATURAL LIGHT & VENTILATION	13
(4) USE OF LOW ENERGY SYSTEMS	16
(5) RE USE OF EXISTING/OLD BUILDINGS	17
(6) DESIGN FOR FLEXIBILITY	17
1.2.2. PRINCIPLE 2	
WORKING WITH CLIMATE	18
1.2.3. PRINCIPLE 3	
MINIMIZATION OF NEW RESOURCES	21
(1) MINIMIZATION OF MATERIALS FOR CONSTRUCTION THAT ARE PROCESSED FROM NON RENEWABLE RESOURCES	21
(2) REUSES OF OLD/EXISTING BUILDINGS	22
(3) USE OF WASTE AS A MATERIAL/RESOURCE	22
(4) AVOID TOXIC SUBSTANCES CONTAINING MATERIALS FOR CONSTRUCTION	23

1.2.4. PRINCIPLE 4	
RESPECT FOR USERS	24
1.2.5. PRINCIPLE 5	
RESPECT FOR SITE	25
1.2.6. PRINCIPLE 6	
WASTE MANAGEMENT	26
1.2.7. PRINCIPLE 7	
HOLISM	27

CHAPTER 2

2. SRI LANKAN VERNACULAR ARCHITECTURE AND PRACTICES OF GREEN ARCHITECTURAL PRINCIPLES	29
2.1. TRADITIONAL SRI LANKAN ARCHITECTURAL PRACTICE	29
2.1.1. TRADITIONAL ARCHITECTURE BEFORE ARRIVAL OF FOREIGN CULTURES	29
2.1.2. TRADITIONAL ARCHITECTURE DURING COLONIAL OCCUPATION	30
2.1.3. EARLY BUILDINGS IN SRI LANKA	30
2.2. TRADITIONAL SRI LANKAN ARCHITECTURAL PRACTICE AS AN ECO-SENSITIVE ARCHITECTURAL PRACTICE	31
2.2.1. ENERGY CONSERVATION IN TRADITIONAL ARCHITECTURE IN SRI LANKA	32
(1) SITE PLANNING	32
(2) MATERIALS SELECTION	32
(3) USE OF NATURAL LIGHT & VENTILATION	33
(4) DESIGN FOR FLEXIBILITY	34
2.2.2. CLIMATIC RESPONSE IN TRADITIONAL ARCHITECTURE	34
2.2.3. RESOURCES UTILIZATION IN TRADITIONAL ARCHITECTURE	35
2.2.4. RESPECT FOR USERS IN TRADITIONAL ARCHITECTURE	36
2.2.5. RESPECT FOR SITE IN TRADITIONAL ARCHITECTURE	36
2.2.6. WASTE MANAGEMENT IN TRADITIONAL ARCHITECTURE	36
2.2.7. HOLISTIC APPROACH	37
2.3. CONTEMPORARY ARCHITECTURE IN SRI LANKA AND THE PRACTICE OF GREEN ARCHITECTURAL PRINCIPLES	37
2.3.1. ENERGY CONSERVATION	38
2.3.2. RESOURCES UTILIZATION	39

2.3.3. WORKING WITH CLIMATE	40
2.3.4. RESPECT FOR USERS	42
2.3.5. RESPECT FOR SITE	42
2.3.6. WASTE MANAGEMENT	42
2.3.7. HOLISTIC APPROACH	43
2.3.8. COMPARISON AND SUMMARY OF TRADITIONAL ARCHITECTURE AND CONTEMPORARY ARCHITECTURE IN SRI LANKA	43

CHAPTER 3

3. GREEN ARCHITECTURE AS A MAJOR ISSUE IN FUTURE	
SRI LANKAN ARCHITECTURAL DESIGNS AND PRACTICES	46
3.1. A GREEN ARCHITECTURAL DESIGN PRACTICE FOR SRI LANKA	47
3.1.1. PRACTICE OF GREEN PRINCIPLES IN FUTURE	
ARCHITECTURAL DESIGNS	48
(1) CONSERVATION OF ENERGY	49
(2) WORKING WITH CLIMATE	52
(3) MINIMIZATION OF NEW RESOURCES	54
(4) RESPECT FOR USERS	56
(5) RESPECT FOR SITE	56
(6) WASTE MANAGEMENT	57
(7) HOLISM	58
3.1.2. INCLUDING GREEN THINKING INTO BUILDING REGULATIONS	58
3.2. A GREEN BUILDING PROCESS FOR SRI LANKAN ARCHITECTURAL PRACTICE	59
CONCLUSION	61
BIBLIOGRAPHY	63

ACKNOWLEDGEMENTS

Many people helped me to make this dissertation a reality. It is to them that I humbly pay tribute....

Dr. L.S.R. Perera, Senior lecturer, Dept, of Architecture for the inspiring discussions, advices and comments, the constant encouragement from the onset till the end and above all for believing in its worth.

Arch. N.M.P. Nawarathne for guidance and valuable advice, concerns and interest shown throughout this effort and correcting the draft.

Dr. Ranjith Dayarathne, Senior Lecturer, Dept. of Architecture for valuable advice given me at preliminary stages.

Prof. Nimal De Silva Head, Dept. of Architecture for valuable advice given me at preliminary stages.

Arch. Nisha Fernando for valuable advice given me.

Staff of the Library University of Moratuwa for the supports given me.

Prasad, Viraj, Iresha, Thushara, Rajitha, Abhaya and all my friends who helped me in numerous ways.

Priyani and her family for all the supports given me specially in the completion.

LIST OF ILLUSTRATIONS / PLATES

Fig No:	Page
01. Conceptual framework for Green Architecture	9
02. Glare due to daylighting from one side	13
03. Improved lighting with windows on two walls	13
04. Window positioning for good ventilation	14
05. Building orientation	15
06. Conventional solar air - conditioning system	15
07. Solar air - conditioning with bio - mass fuel	16
08. An energy efficient office	19
09. Shading devices and wind catching terraces	20
10. A house wall constructed by beer bottles	22
11. A gallery - made out of paper tubes	22
12. A house on stilts	25
13. NMB Bank - Holand	28
14. A traditional house	31
15. Cleastorey lighting of a shrine room	33
16. Court yard of a traditional house	35
17. A wattle & daub house	36
18. Climatic responsive multi storey buildings Lanka	41
19. National library - Colombo	50
20. New Parliament - Sri Jayawardanapura	51
21. Audiance hall - Kandian Art association Kandy	51
22. Union Assuarance building - collpetty	52
23. Mahaweli Authority building - Colombo	53
24. Transworks house - Fort - Colombo	54
25. Dental institue building - Colombo	55
26. A Hotel - Kandapola	55
27. A house at Kandy	57
28. Green building process	60