

## CONTENTS

## PAGE NUMBER

ABSTRACT	i
ACKNOWLEDGEMENT	iii
LIST OF FIGURES & TABLES	iv
TABLES OF CONTENTS	vi
CHAPTER 1 : INTRODUCTION	
1.1 STATEMENT OF PROBLEM	1
1.2 AIMS AND OBJECTIVES	2
1.3 BASIS FOR STUDY	2
1.4 SCOPE OF STUDY	4
1.5 ORGANISATION OF THESIS	6
CHAPTER 2 : LITERATURE REVIEW AND THE STUDY AREA	
2.1 LITERATURE REVIEW	7
2.1.1 Rainfall and Runoff	7
2.1.2 Stream Suspended Sediment	9
2.1.3 Energy Generation	10
2.2 THE STUDY AREA	11
2.2.1 General Geology	12
2.2.2 Physiography	13
2.2.3 Drainage	14
2.2.4 Slope Terrain	15
2.2.5 Economic Activities	17
2.3 HYDRO POWER DEVELOPMENT	18
2.3.1 Project Layout	18
2.3.2 Ringlet Reservoir	22
2.3.3 Generating Plant	23

## **CHAPTER 3 : METHODOLOGY**

3.1	METHODS OF STUDY	24
3.1.1	Annual Rainfall Determination	25
3.1.2	Annual Runoff Assessment	27
3.1.3	River Suspended Sediment Load Determination	28
3.1.4	Annual Energy Output Assessment	28
3.2	DATA COLLECTION	31
3.2.1	Landuse Data	31
3.2.2	Rainfall Data	32
3.2.3	Stream Flow Data	33
3.2.4	Suspended Sediment Data	34
3.2.5	Annual Energy Output Data	36
3.3	DATA TREATMENT	36
3.3.1	Estimation Of Missing Monthly Rainfall	36
3.3.2	Estimation Of Missing Monthly Mean Flow	38

## **CHAPTER 4 : LANDUSE, RUNOFF AND SUSPENDED SEDIMENT.**

4.1	DEVELOPMENT AND FARMING PRACTICES	42
4.1.1	Development Activities	42
4.1.2	Farming Practices	43
4.2	THE CHANGE IN LANDUSE	44
4.2.1	Land Use Survey	45
4.2.2	Market Gardening	47
4.3	CATCHMENT ANNUAL MEAN RAINFALL	49
4.4	PRELIMINARY OBSERVATION	51
4.5	ANNUAL RAINFALL/RUNOFF	52
4.5.1	Moving Average Method	54
4.5.2	Consistency Check	56
4.5.3	Correlation And Double Mass Curve	58
4.5.4	Discussion	62

4.6	SUSPENDED SEDIMENT LOAD	66
4.6.1	Sediment Rating Curve	67
4.6.2	Suspended Sediment Yield Comparison	70
4.6.3	Double Mass Curve	73
4.6.4	Discussion	73
<b>CHAPTER 5 :</b>	<b>ANNUAL ENERGY OUTPUT</b>	
5.1	THE ROBINSON FALLS, HABU AND JOR POWER STATION	77
5.2	OPERATION OF ROBINSON FALLS AND HABU STATION	78
5.3	OPERATION OF JOR STATION	79
5.4	ANALYSIS AND DISCUSSION	80
5.4.1	Double Mass Curve	82
5.4.2	Double Ratio	85
5.4.3	Comparison	87
<b>CHAPTER 6 :</b>	<b>CATCHMENT MANAGEMENT AND CONCLUSION</b>	
6.1	CAMERON HIGHLANDS STRUCTURE PLAN AND ITS IMPLICATIONS	92
6.2	ISSUES IN WATERSHED MANAGEMENT	95
6.3	LAND USE MANAGEMENT	96
6.4	MITIGATION OPTIONS	101
6.5	CONCLUSION AND REMARKS	102
6.5.1	Conclusion	104
6.5.2	Remarks	105
6.6	SUGGESTIONS FOR FUTURE WORKS	106
REFERENCES		108 - 112
APPENDICES		113 - 155