

Contents

PREFACE	VI
1 GENERAL INTRODUCTION	VI
PART I FACTORS AFFECTING EROSION AND TRANSPORTATION PROCESSES BY WATER	1
2 INTRODUCTION	1
3 CLIMATE	1
3.1 Precipitation	1
General remarks 1 · The impact of raindrops 1 · The kinetic energy of rainfall 3 · Overland flow 4 · Global differences in precipitation intensity 7 · Distribution of overland flow 10 · Precipitation parameters and soil loss 12	
3.2 Temperature	14
Effects on evapotranspiration and runoff 14 · Effects on water erosivity and transport capacity 14 · Effects on soil erodibility 15	
3.3 Frost and snow	16
Freeze-thaw processes and soil characteristics 16 · Erosional conditions 16	
3.4 Seasonality	17
General remarks 17 · Water erosion in climates with seasonal aridity 17 · A seasonality index 18	
3.5 Wind	18
Influences on erosivity 18 · Influences on erodibility 18	
4 RELIEF AND AREA	19
4.1 Introduction	19
4.2 Slope inclination and slope length	19
4.3 Topography of drainage basins	19
4.4 The size of the drainage basin	20
4.5 Relief and area parameters	21
5 SOIL AND ROCK TYPE	24
5.1 Soil characteristics	24
Introductory remarks 24 · Texture 24 · Structure 25 · Permeability 26 · Erodibility indices 26	
5.2 Relation between rock type and soil characteristics	28
Effects on soil texture 28 · Effects on soil aggregation 29 · Effects on infiltration rate 29	
5.3 Relation between climate and soil characteristics	29
Introductory remarks 29 · Clay eluviation 29 · Type of clay 30 · Crust formation 30 · Soil structure 30 · Climatic differences in soil erodibility 31	
6 VEGETATION	32
6.1 Introduction	32
6.2 Effects on soil detachment and transport by rainfall and runoff	32
6.3 The influence of vegetation on water erosion in different climates	33
6.4 Some reflections on the importance of vegetation in erosion	35
7 MAN'S ACTIVITIES	38
7.1 Types of effect	38
7.2 Man's influence on erosion magnitude	38

PART II THE CLIMATIC CONTROL ANALYSED IN SOIL LOSS MODELS	42
8 INTRODUCTION	42
9 BIVARIATE REGRESSIONS ON SEDIMENT YIELD	43
9.1 Introduction	43
9.2 Precipitation as an independent variable	44
9.3 Runoff as an independent variable	48
9.4 Water discharge as an independent variable	50
10 MULTIPLE REGRESSIONS ON SEDIMENT YIELD AND DELIVERY RATIO	51
10.1 Sediment yield equations	51
10.2 Delivery ratio equations	62
11 EMPIRICAL MODELS BASED ON RESULTS FROM PLOT AND SLOPE STUDIES	64
12 DETERMINISTIC MODELS	74
 PART III CLIMATIC DIFFERENCES IN EROSION RATE AN ANALYSIS OF EROSION MAPS	76
13 INTRODUCTION	76
14 GLOBAL MAPS BASED ON SEDIMENT YIELD MEASUREMENTS	77
14.1 The maps by Fournier and Strakhov and the UNESCO map	77
14.2 Evaluation of the global maps	79
15 REGIONAL MAPS BASED ON SEDIMENT YIELD MEASUREMENTS	80
15.1 Presentation of regional maps	80
Introductory remarks 80 · Yugoslavia 80 · Rumania 82 · Italy 84 · Cyprus 85 · Poland 87 · the USSR 87 · Canada 91 · the USA 92 · Pakistan 99 · China 100 · Japan 101 · Morocco 101 · South Africa 102 · the Cameroon 102	
15.2 General discussion of the reliability of regional maps	103
15.3 Summary of the reliability of global maps based on a comparison with regional maps	104
16 QUALITATIVE SOIL EROSION MAPS AND OTHER SPECIAL TYPES OF MAPS	105
16.1 Maps of topsoil loss	105
The USA 105 · Latin America 108 · Hungary 111 · Northern Ghana 113 · China 113 · Land capability maps 114	
16.2 Maps based on visible erosion features	114
16.3 Maps of potential erosion	115
Poland 115 · East Germany 116 · West Germany 116 · Morocco 118 · North Africa, the Near and Middle East and the Kenyan Rangeland 118 · Czechoslovakia 119	
16.4 Evaluation	119
17 CONCLUDING DISCUSSION OF MAP ANALYSIS	120
17.1 Introduction	120
17.2 Sediment yield in different climates	121
17.3 Erosion in mountainous terrain	121
17.4 Erosion in loess areas	122
18 SUMMARIZING REMARKS AND PROPOSALS FOR FUTURE RESEARCH ..	124

APPENDIX	128
SHORT REVIEW OF MULTIPLE REGRESSIONS OF SEDIMENT YIELD WITH A DISCUSSION OF THE VARIABLES	
REFERENCES	141