

Table of Contents

Abstract	i
Acknowledgement.....	ii
Table of Contents	iv
List of Figures	vi
List of Tables.....	vii
CHAPTER 1. INTRODUCTION.....	1
1.1 Background	1
1.2 Research Problem.....	3
1.3 Goal and Objectives	5
1.4 Research Questions	6
1.5 Thesis Structure.....	6
CHAPTER 2. LITERATURE REVIEW.....	8
2.1 Landslides.....	8
2.2 Debris Flows.....	8
2.3 Landslide Inventory.....	10
2.4 Landslide Susceptibility Assessment	11
2.5 Debris Flow Susceptibility Assessment	12
2.6 Theoretical Framework	14
CHAPTER 3. MATERIALS AND METHODS	16
3.1 Materials and Equipment.....	16
3.2 Method Applied.....	18
3.2.1 Analyzing Landslide Susceptibility	18
3.2.2 Debris Flow Modelling	20
3.2.3 Critical Analysis of Debris flow Susceptibility	24
3.3 Fieldwork.....	25
3.4 Data Collection and Processing.....	26
3.4.1 Extracting 3 Days Cumulative Rainfall Data.....	26
3.4.2 Extracting Landform Map.....	27
3.4.3 Generating Landslides Polygon	29
3.4.4 Aerial Photograph Acquisition and Photos Processing.....	30
3.4.5 Laboratory Analysis of Soil	31
CHAPTER 4. STUDY AREA.....	33
4.1 Administrative and Geographic Position	33
4.2 Altitude.....	34

4.3	Climatology	35
4.4	Geology	37
4.5	Land Use.....	38
4.6	Landslides.....	39
CHAPTER 5. RESULT AND DISCUSSION.....		41
5.1	Landslides.....	41
5.1.1	Landslides Inventory	41
5.1.2	Landslide Susceptibility Assessment	43
5.1.2.1	Landslides Density	43
5.1.2.2	Rainfall	43
5.1.2.3	Geology	46
5.1.2.4	Land Use.....	47
5.1.2.5	Slope and Landform Combination	49
5.1.2.6	Level of Landslide Susceptibility.....	53
5.2	Debris Flow	56
5.2.1	Debris Flow Modelling	57
5.2.1.1	First Debris Flow	57
5.2.1.2	Second Debris Flow	61
5.2.1.3	Third Debris Flow	65
5.2.2	Model Parameterization	68
5.2.2.1	Soil Density (ρ)	70
5.2.2.2	Earth Pressure Coefficient (λ)	71
5.2.2.3	Viscous Turbulent Friction (ξ)	72
5.2.2.4	Dry Coulomb Friction (μ)	73
5.2.2.5	Soil Cohesion (c)	74
5.3	Debris Flow Susceptibility Analysis	74
5.3.1	Susceptible Area of Debris Flows.....	75
5.3.2	Level of Debris Flows Susceptibility.....	78
5.3.3	Summary of Debris Flows Susceptibility	78
CHAPTER 6. CONCLUSIONS AND RECOMMENDATIONS.....		80
6.1	Conclusions	80
6.2	Recommendations	83
REFERENCE.....		85
APPENDIX.....		89