

Table 1 Factor coefficient of heterogeneity

Factor	Lithology	NDVI	SPI	TWI	Surface roughness	Relief f	Elevation	DFF	Slope	aspect	DFW	LUT	Slopes structure	DFR
CoV	0.31	0.14	1.44	0.43	0.13	0.55	0.14	1.54	0.43	0.54	0.12	0.58	0.43	1.16

Table 2 Hazard density Z standardized values for each factor grading interval

Factor	Grading range				
Slope	--15°	15-23°	23-31°	31-41°	41°-90°
Hazard density	3.09	2.29	1.47	0.73	0.50
Z-score value	1.36	0.62	0.13	0.82	1.03
Aspect	0-71°	71-144°	144-214°	214-284°	284-360°
hazard density	1.65	1.93	1.73	1.41	1.30
Z-score value	0.19	1.28	0.52	0.79	1.19
TWI	<2.89	2.89-4.10	4.10-5.91	5.91-11.81	>19.15
hazard density	1.28	1.87	2.08	2.38	0.00
Z-score value	0.26	0.37	0.60	0.91	1.62
SPI	-0.13-2.89	2.89-4.10	4.10-5.91	5.91-11.81	11.81-19.15
hazard density	152.85	2.21	2.92	1.76	0.75
Z-score value	1.79	0.44	0.43	0.45	0.46
Relief	<67m	67-104m	104-141m	141-189m	>189m
Hazard density	2.29	1.67	1.10	0.57	0.00
Z-score value	1.30	0.60	0.03	0.62	1.25
Distances to road	<100m	100-200m	200-300m	300-400m	>400m
hazard density	0.23	0.22	0.18	0.13	0.07
Z-score value	0.94	0.91	0.12	0.55	1.41
Distance to fault	<500m	500-1000m	1000-1500m	1500m-2000m	>2000m
hazard density	1.79	1.83	1.60	0.87	0.32
Z-score value	0.77	0.83	0.48	0.62	1.46
Lithology	lithology 1	lithology 2	lithology 3	lithology 4	lithology 5
hazard density	9.51	52.57	22.62	4.49	7.42
Z-score value	0.29	2.68	0.61	0.64	0.43
Lithology	lithology 6	lithology 7	lithology 8	lithology 9	lithology 10
hazard density	9.14	9.61	6.82	7.05	7.89
Z-score value	0.32	0.28	0.48	0.46	0.40
Land-use type	farmland	forestland	grassland	shrubland	water
hazard density	2.08	0.56	0.96	1.25	0.00
Z-score value	0.82	0.41	0.09	0.14	0.87
land-use type	building land	waste land	snowland		
hazard density	3.79	1.01	0.00		

Z-score value	2.20	0.05	0.87		
slope structure type	dip slope	escarpment slope	sideways slope	oblique slope	block structure slope
hazard density	1.07	1.07	0.91	0.79	3.38
Z-score value	0.31	0.32	0.48	0.60	2.03
slope structure type	soil slope				
hazard density	1.05				
Z-score value	0.33				

Note: The green color in the table represents anthropogenic errors and the red color represents anomalous intervals.

Table 3 Density of geohazard in different strata

stratum	Number of geologic hazard	area (km ²)	Density of hazard
Upper Cretaceous Ledashu Formation	30	150.54	0.20
Lower Cretaceous Xiaotian Formation	66	666.72	0.099
Upper Jurassic Feitianshan Formation	18	182.43	0.098
Middle Jurassic Niugundang Formation	25	327.47	0.076
Middle Jurassic Xincun Formation	12	152.09	0.078
Middle Jurassic Yimen Formation	4	79.74	0.050

Table 4 Evaluation factor screening results and their weights (global scale)

factor	SPI	DFF	Aspect	LUT	DFR
independence	0.83	0.94	0.94	0.83	0.90
CoV	1.86	1.30	0.55	0.52	0.51
weights	0.36	0.3	0.13	0.1	0.11

Table 5 Evaluation factor screening results and their weights (local scales)

	factor	SPI	DFF	LUT	DFR	DFW
Zone 1	independence	0.44	0.69	0.65	0.50	0.71
	CoV	3.73	2.05	0.95	0.93	0.82
	weights	0.35	0.30	0.13	0.10	0.12
	factor	DFF	SPI	Lithology	Aspect	LUT
Zone 2	independence	0.63	0.82	0.65	0.72	0.78
	CoV	1.99	0.94	0.66	0.56	0.55
	weights	0.38	0.23	0.13	0.12	0.13
	factor	SPI	DFF	Aspect	DFW	slope structure
Zone 3	independence	0.93	0.92	0.84	0.82	0.84
	CoV	1.64	1.06	0.54	0.52	0.42
	weights	0.41	0.26	0.12	0.12	0.09
	factor	SPI	DFF	DFW	Aspect	LUT
Zone 4	independence	0.88	0.72	0.74	0.72	0.76
	CoV	1.96	1.34	0.68	0.61	0.59
	weights	0.42	0.24	0.12	0.11	0.11

Table 6 Evaluation parameters of susceptibility mapping

scale	Evaluation parameters	Zone 1	Zone 2	Zone 3	Zone 4
local	AUC	0.68	0.74	0.68	0.74
	CoV	0.19	0.24	0.14	0.20
	precision	0.81	0.34	0.40	0.59
	recall	0.60	0.64	0.64	0.90
overall	AUC	0.62	0.70	0.70	0.60
	CoV	0.20	0.18	0.18	0.18
	precision	0.52	0.30	0.44	0.50
	recall	0.31	0.39	0.73	0.67

Table 7 Results of risk detection

Factor	Zone 1	Zone 2	Zone 3	Zone 4
SPI	-0.21	0.43	0.23	0.17
TWI	4.51	3.43	3.42	3.65
slope	17.08	30.76	25.25	22.01
slope structure	3.76	3.24	2.49	2.47
LUT	25.68	23.14	22.05	21.58
lithology	6.19	3.41	7.50	8.00
relief	34.31	87.83	68.95	65.15
DFF	766.79	896.27	2215.25	1633.19

Table 8 Results of ecological detection

Factor	TWI	Slope	slope structure	lithology	LUT	relief	DFF	SPI
TWI								
Slope	N							
slope structure	Y	Y						
lithology	Y	Y	Y					
LUT	N	N	Y	Y				
relief	N	N	Y	Y	N			
DFF	N	N	N	Y	N	N		
SPI	N	N	Y	Y	N	N	N	

Table 9 Statistics on the density of geologic hazard by zone

zoning	Zone 1	Zone 2	Zone 3	Zone 4	whole region
Number of hazard(number)	45	33	119	30	227
area (km ²)	182.21	529.89	1254.26	150.59	2116.95
Hazard intensity (number /km ²)	0.25	0.06	0.09	0.20	0.11

Table 10 Comparison of the degree of discretization of evaluation factors

	factor	SPI	DFF	Aspect	DFW	slope structure/LUT
CoV	local	1.63	1.05	0.53	0.51	0.42
	overall	1.86	1.30	0.55	0.51	0.46